DISPERSION MODELING PROTOCOL FOR THE DETERMINATION OF AMBIENT AIR QUALITY IMPACTS FOR NOx

Prepared For

KNAUF FIBER GLASS GmbH
Shasta Lake, California

DRAFT

Mostardi Platt
Environmental

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MOSTARDI PLATT ENVIRONMENTAL PROJECT M030601
DATE SUBMITTED: MARCH 18, 2003

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Prepared For
KNAUF FIBER GLASS GmbH
Shasta Lake, California
March 18, 2003

INTRODUCTION

Knauf Fiber Glass GmbH (Knauf) operates a 195 ton per day fiberglass manufacturing facility in Shasta County, California. A site location map can be found in Figure 1. The plant site is a 92 acre parcel in Shasta Lake. The facility address is:

Knauf Fiber Glass
3100 District Drive
Shasta Lake, California 96019

Project Contact

Mr. Stephen R. Aldridge
Manager, Environmental Health and Safety
Knauf Fiber Glass GmbH
240 Elizabeth Street
Shelbyville, Indiana 46176
Phone: 317-398-4434 Ext: 8408

Consultant Contact

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Principal Consultant
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Permit History

Knauf submitted an air quality permit application under the federal Prevention of Significant Deterioration (PSD) requirements on July 17, 1997. A PSD permit application was completed for PM-10 because there was potential for the particulate emission rates to exceed 100 tons per year and thus trigger PSD review for PM-10. Using the conservative estimates, PM-10 emissions would have been 191.8 tons/year (43.6 lb/hr), and the PSD threshold was 100 tons/year. All other air pollutant emissions were considered minor in comparison to the PSD threshold as shown in Table 1.

After an extensive period of appeals, the PSD permit was issued three years later on March 22, 2000 with a reduced PM-10 emission limit of 124.4 tons per year (28.4 lb/hr). Construction of the facility commenced immediately and the plant began operation on February 4, 2002. Air emissions testing was completed in April and December, 2002.

Based on oven and incinerator burner manufacturer's emission estimates, nitrogen oxides (NOx) emissions from the facility were expected to be minor due to the use of low NOx burners in the fiberglass curing oven. As a result, NOx was not formally evaluated under PSD in the original PSD permit application, but was evaluated in the CEQA EIR and the required California BACT analysis.

The results of the air emissions testing program demonstrated that the PM-10 emission rate was equivalent to a level below 100 tons per year (approximately 14 lb/hr without margin for uncertainty). NOx emissions test results demonstrated that the actual emissions resulted in a level that exceeded 40 tons per year, but were less than 100 tons per year.

This air quality modeling protocol has been prepared to present the methodology planned for an evaluation of the air quality impacts resulting from the NOx emissions increase from 24.8 tons per year to 74.5 tons per year.

Air Quality Standards

For areas that are in attainment with the NAAQS, maximum allowable increases or "increments" in ambient pollution concentrations have been established for PM_{10}, NO_x, and SO_2. These PSD increments are presented in Table 2, along with the California Air Resources Board Air Quality Standards (CARBAQS), Significant Impact Levels (for modeling purposes), and 8-hour Personal Exposure Limits (PEL). The PSD increments are an absolute ceiling, stated as the maximum allowable increases in concentration of the pollutant over a baseline concentration. In effect, the PSD increments, when added to baseline concentrations represent new ambient air quality levels for PSD areas.

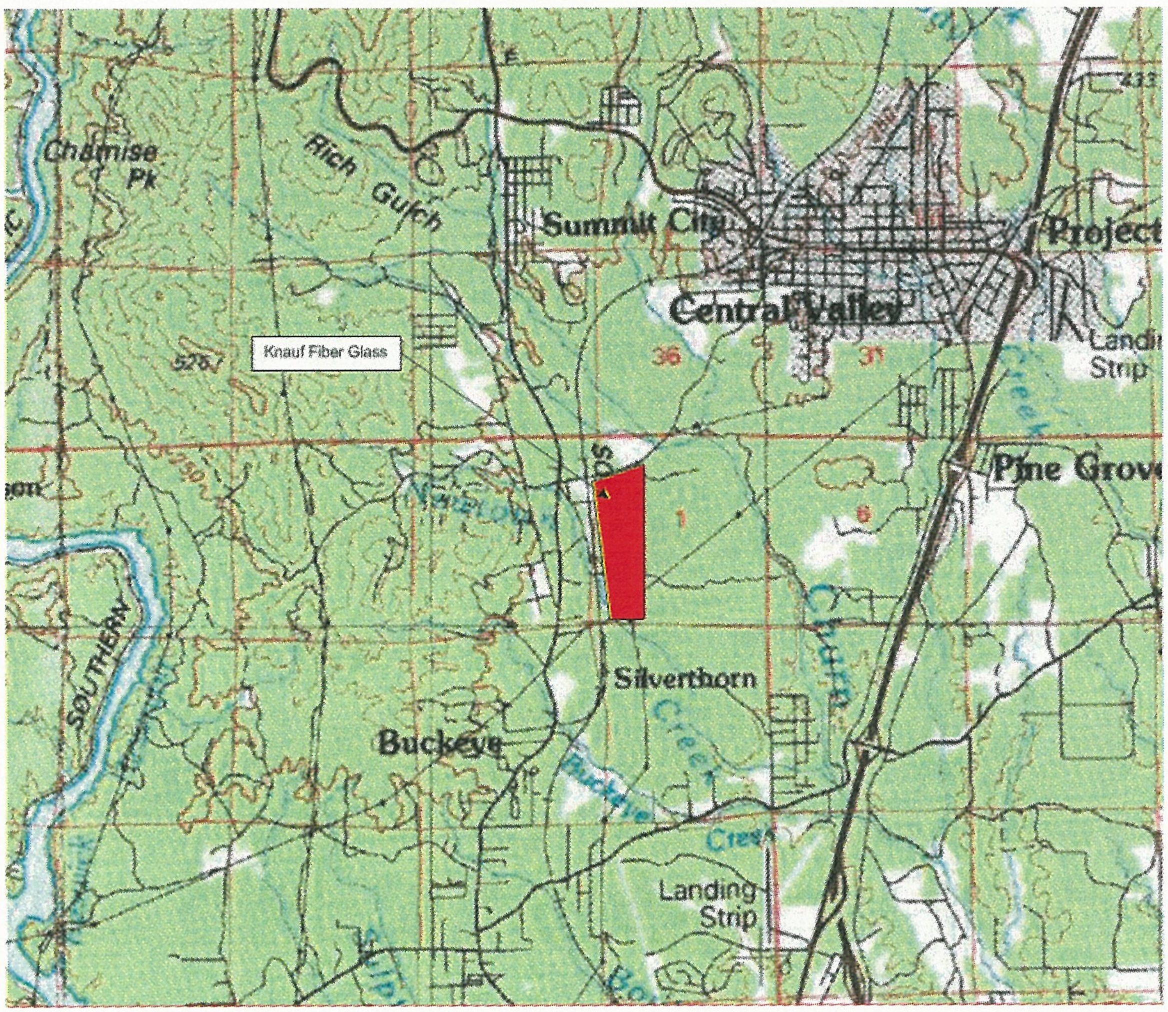

Figure 1. Site Location Map

Table 1. Knauf Shasta Facility Emissions from Original PSD Application.

Pollutant	Knauf Plant, TPY	PSD Review Required?
PM_{10}	191.8 (124.4)[a]	**Yes**
NOx	24.8	No
SO_2	4.4	No
CO	97.7	No
ROG (includes Formaldehyde and Phenol)	39.4	No
Formaldehyde	8.76	No
Phenol	26.28	No
Ammonia	166.4	No

Note: All PM is considered to be PM_{10}.
[a] PSD permit issued had a reduced PM-10 limit.

Emission Source

The NOx emissions are a result of combustion in the oven burners in the curing oven. After the fiberglass mat is formed, it continues on a conveyer to the curing oven. The purpose of the curing oven is to drive off the moisture remaining on the fibers and cure the binder. The oven has six zones. Each zone has its own low NO_x burner and blower to recirculate the hot air through the fiberglass mat. The oven temperature ranges from 450 °F to 550 °F. Hoods are at the entry and exit of the oven to capture the exhaust from the oven.

The regulated pollutants emitted from the curing oven are particulate matter and reactive organic gasses from heating the binder, and nitrogen oxides, sulfur oxides, and carbon monoxide from the natural gas combustion burners. These pollutants are sent to thermal oxidizers prior to entering the main stack.

NOx emissions from the oven burners are at, or below, the manufacturer's estimated levels; however, the unexpected increase in NOx above the permitted limit is primarily due to the conversion of ammonia (released from the binder during curing) to additional NOx when the flue gases pass through the thermal oxidizer.

Table 2. Air Quality Standards.

Pollutant	Averaging Period	NAAQS ($\mu g/m^3$)	CARBAQS ($\mu g/m^3$)	PSD Increment ($\mu g/m^3$)	Significant Impact Levels ($\mu g/m^3$)	PEL ($\mu g/m^3$)
Ozone	1-Hour	235	175	-	-	-
PM10	Annual	50	30	17	1	-
	24-Hour	150	50	30	5	-
NOx	**Annual**	**100**	**-**	**25**	**1**	**-**
	1-Hour	**-**	**500**	**-**	**-**	**-**
SO_2	Annual	80	-	20	1	-
	24-Hour	365	105	91	5	-
	3-Hour	1,300	-	512	25	-
	1-Hour	-	655	-	-	-
CO	8-Hour	10,000	10,000	-	500	-
	1-Hour	40,000	23,000	-	2000	-
Form-aldehyde	8-Hour	-	-	-	-	2,000
Phenol	8-Hour	-	-	-	-	19,000
Ammonia	8-Hour	-	-	-	-	18,000

AIR QUALITY IMPACT DISPERSION MODELING

Dispersion Model

Ambient air quality impacts for NOx from the Knauf facility will be assessed using the latest version of the Industrial Source Complex Short-Term (ISCST3) Prime dispersion model (with the Prime algorithm). The ISCST3 model was approved for use in the original PSD permit application and is proposed for the further evaluation of NOx emissions from the Knauf facility. The ISCST3 model is capable of assessing impacts from a variety of separate sources in regions of simple or complex terrain. If necessary, the ISCST3 model can evaluate impacts of multiple sources and sources over distances up to 31.25 miles (50 kilometers).

EPA regulatory default options (final plume rise, stack tip downwash, buoyancy-induced dispersion, default wind profile exponents, default temperature gradients, calms processing) will be used.

Facility structures (coordinates, height, ground elevation) will be programmed into the model as shown in the example in Figure 2. The model will perform direction-specific downwash evaluations if the stack heights are less than Good Engineering Practice (GEP).

The first phase of the modeling study will be a preliminary analysis to determine if there are any "significant" increases of ambient NOx concentrations from the facility. The preliminary analysis will determine if the project can forgo further air quality analysis for NOx, be exempted from the ambient air quality monitoring data requirements, and define the impact area within which a full impact analysis must be carried out.

A full impact analysis will be performed for NOx if the facility's estimated ambient pollutant concentrations exceed prescribed significant ambient impact levels. The full impact analysis, if necessary, will consider emissions from the proposed source, existing sources, and appropriate secondary emissions.

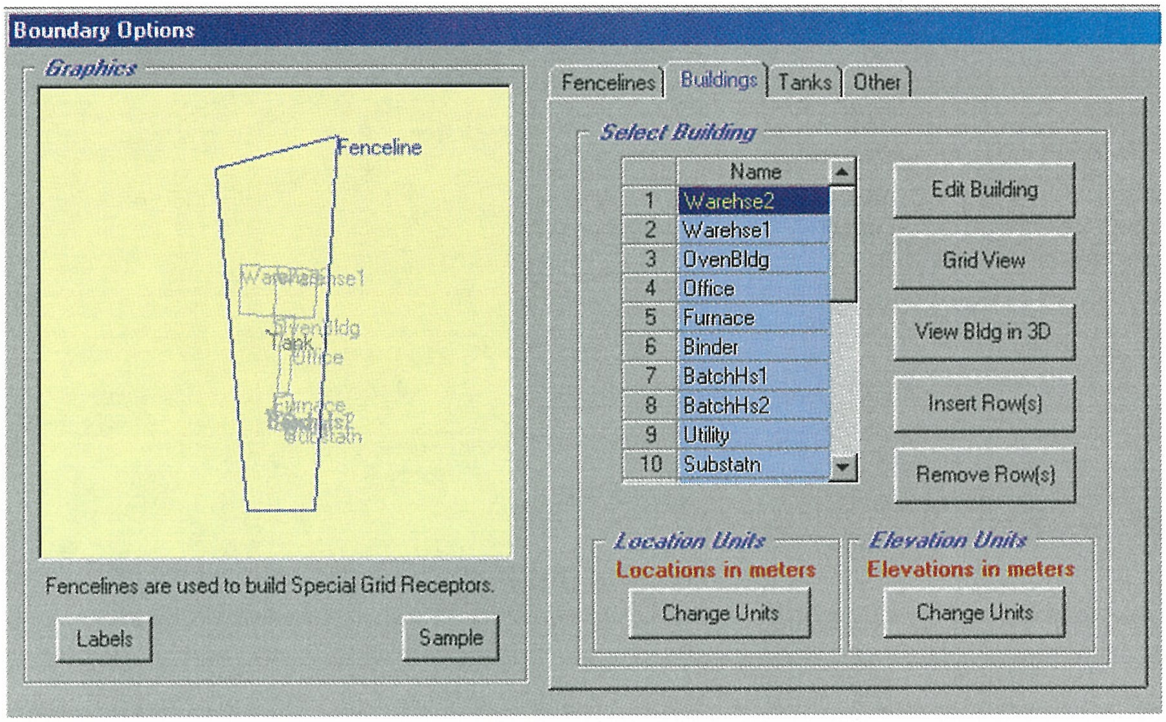

Figure 2. Sample Input Screen for Programming Facility Structures in ISCST3.

Emissions and Stack Parameters

The stack exit parameters and emission rate to be used in the modeling are presented in Table 3.

Table 3. Stack Exit Parameters and Emission Rates.

Parameter	Forming Stack
Stack Height, ft	199
Exit Temperature, deg F	190
Exit Diameter, ft	17
Flow Rate, ACFM	447,531
Exit Velocity, ft/s	32.9
NOx Emissions, lb/hr	20.5

Load Conditions

PSD guidelines require that air quality impacts be evaluated at minimum, intermediate, and maximum load conditions due to the variability of emission rates and stack exit conditions as a function of operating load. However, the Knauf facility can only operate at 100% load, so no part load modeling will be performed.

Meteorological Data

Meteorological data for the modeling will be based on five (5) years of hourly surface data from the Redding airport, covering the period 1987-1991. Concurrent upper air mixing height data was obtained from the nearest available source in Medford, Oregon. The data is pre-processed for input into the ISCST3 dispersion model. This period matches the years used in the original PSD application.

Terrain Data

The terrain surrounding the facility is considered complex, which is characterized by terrain features above the effective stack height of the forming stack. Since complex terrain modeling was required, digitized terrain in 30 meter increments out to 48 kilometers in each direction from the plant was obtained from the United States Geological Survey. The ISCST3 model will perform a linear interpolation using the nearest four (4) points in the terrain file.

Land Use Classification

Land use within 3 km of the proposed project site was evaluated in the original PSD application. The Auer classification procedure resulted in a rural determination since 70% of the area surrounding the facility was classified as rural. Therefore, rural dispersion coefficients will be used for future modeling.

Receptor Grid

In order to thoroughly evaluate the air quality impacts surrounding the plant site, a dense receptor grid using rectangular UTM coordinates will be used. The receptor grid will be:

- 100 meters out to 2600 meters
- 200 meters out to 5000 meters
- 500 meters out to 10000 meters
- 5000 meters out to 45000 meters

The grid will be adjusted, if necessary, so that the maximum impacts will be determined to the closest 100-meter rectangular coordinate. Figure 3 illustrates the proposed grid.

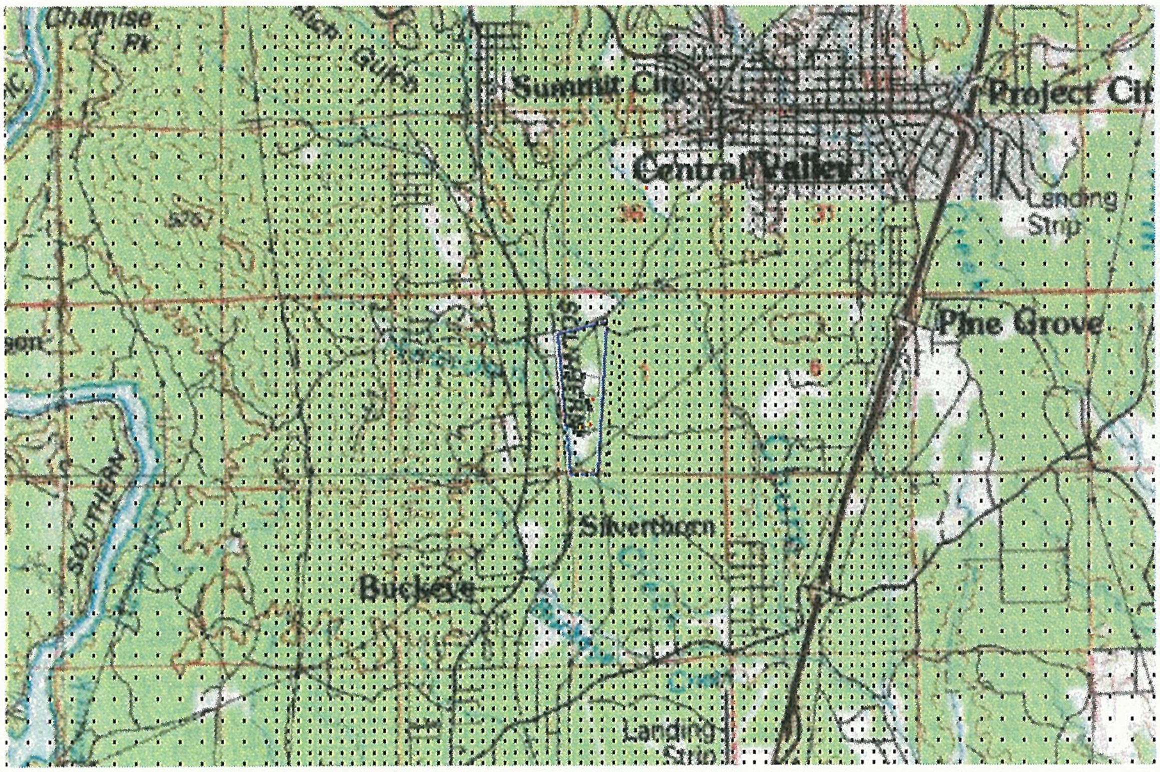

Figure 3. Sample Receptor Grid Near the Knauf Facility

Averaging Periods

The model will be set up to calculate the following concentrations:

NO_x Annual and 1-hour averages

Ambient Air Quality Monitoring Data

Existing ambient air quality data from Redding, California will be used for the background data. Data from the most recent three year period, 2000-2002, will be provided by Mr. Michael Kussow of the Shasta County Air Quality Management District.

Additional Impacts - Growth Analysis

A growth analysis has already been completed for the Knauf facility in Shasta and no further growth will be associated with the change in NOx emissions. Therefore, no new growth analysis will be completed.

Additional Impacts - Soils and Vegetation Impacts Analysis

The soils and vegetation impact due to air pollutant emissions will address potential for damage. The critical factors consist of, but are not limited to, the plant species, the ambient pollutant concentration, possibility of a reaction with other pollutants, the soil characteristics and moisture conditions, and the humidity of the atmosphere. This study will compare the increase NOx emissions impacts to EPA screening concentrations below which the soils and vegetation will not experience any adverse effects of air pollution (EPA, 1981, "A Screening procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals).

Additional Impacts – Visibility Impairment

The original PSD permit application included a Level II visibility impairment analysis for particulate emissions. No credit was taken for the fact that all PM-10 and NOx emissions were offset. Since actual PM-10 emissions are approximately 50% of the original study, no further visibility analysis should be required. The original study used a PM-10 emission rate of 43.6 lb/hr, and the PSD permit was issued at 28.4 lb/hr.

Ambient Air Quality Impact Results

To validate the air quality impact analysis, all modeling input and output files, plus meteorological data and terrain files, will be provided to the Region IX on CD-ROM. Modeling summaries will be included in an Appendix to the PSD permit application.

If you have any questions or comments regarding this protocol or require additional information, please contact the undersigned at 630-993-2127.

Respectfully submitted,

MOSTARDI-PLATT ASSOCIATES, INC.

Joseph J. Macak III
Principal Consultant

input in STSS SAC 03-01 NSR 4-4-4

Mostardi Platt

AIR PERMIT MODIFICATION

Prepared For
KNAUF FIBER GLASS
Shasta Lake, California

May 21, 2003

Mostardi Platt
Environmental

U. S. EPA Region 9
Knauf Insulation
NSR 4-4-4, SAC 03-01
Docket Index #: V-C

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AIR PERMIT MODIFICATION
Prepared For
KNAUF FIBER GLASS
Shasta Lake, California
May 21, 2003

MPE PROJECT M030601

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Knauf Fiber Glass - Shasta Lake, California

Mostardi Platt Environmental

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AIR PERMIT MODIFICATION
Prepared For
KNAUF FIBER GLASS
Shasta Lake, California
May 21, 2003

1.0 INTRODUCTION

Knauf Fiber Glass GmbH (Knauf) operates a 195-ton per day fiberglass manufacturing facility in Shasta County, California. A site location map can be found in Figure 1.0-1. Shasta County is located at the northern end of the Sacramento Valley Air Basin.

The plant site is a 92-acre parcel in Shasta Lake. The facility address is:

Knauf Fiber Glass
3100 District Drive
Shasta Lake, California 96019

The UTM coordinates (NAD 27, Zone 10) at the center of the facility are:

Northing	4,500,750	meters
Easting	551,620	meters

The Latitude and Longitude at the center of the facility are:

Latitude	40°	39'	30"
Longitude	122°	23'	23"

1.1 Project Contact

Mr. Stephen R. Aldridge
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Knauf Fiber Glass
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1.2 Consultant Contact

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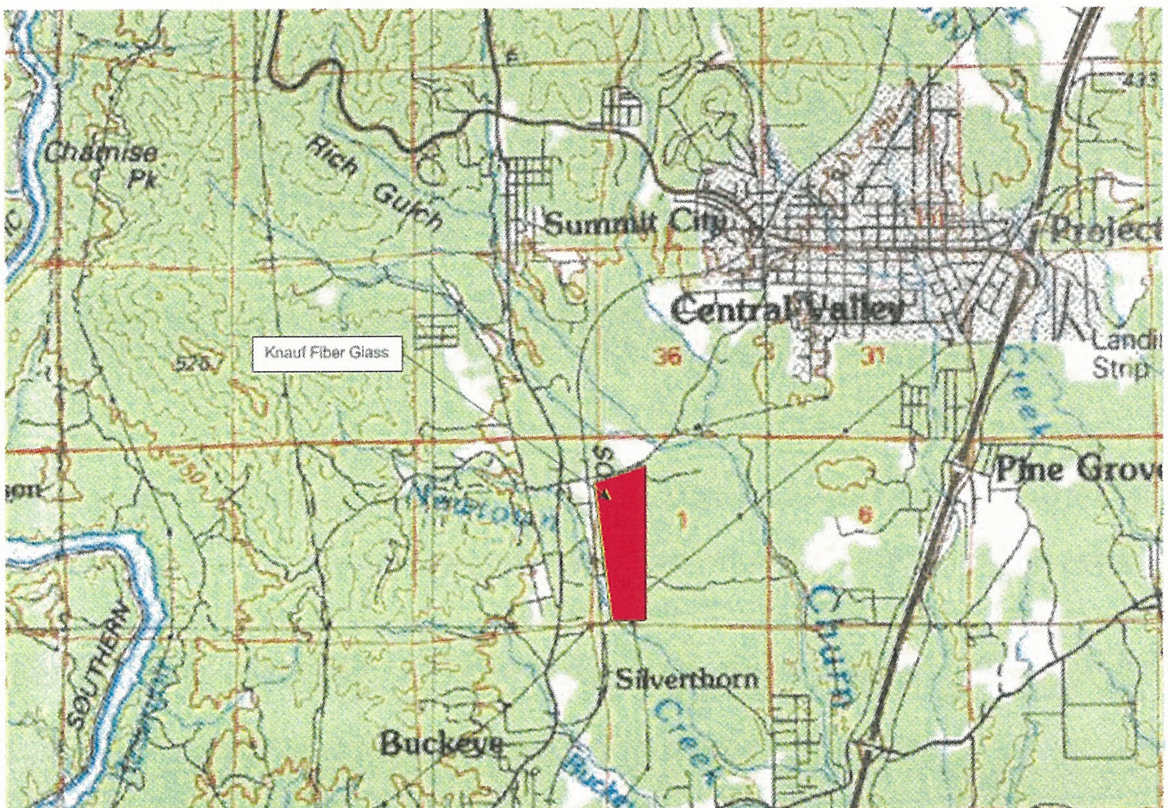

Figure 1.0-1. Site Location Map

1.3 Permit History

Knauf submitted an air quality permit application under the federal Prevention of Significant Deterioration (PSD) requirements on July 17, 1997. A PSD permit application was completed for PM_{10} because there was potential for the particulate emission rates to exceed 100 tons per year (TPY) and thus trigger PSD review for PM_{10}. Using the conservative estimates, PM_{10} emissions were estimated at 191.8 TPY (43.6 lb/hr), and the PSD threshold is 100 TPY. All other air pollutant emissions were considered minor in comparison to the PSD thresholds as shown in Table 1.3-1. All analyses for PM_{10} for the original PSD application were based on 191.8 TPY.

Table 1.3-1. Knauf Shasta Facility Emissions from Original PSD Application.

Pollutant	Knauf Plant, TPY	PSD Review Required?
PM_{10}	191.8 (124.4)[a]	**Yes**
NO_x	24.8	No
SO_2	4.4	No
CO	97.7	No
ROG (includes Formaldehyde and Phenol)	39.4	No
Formaldehyde	8.76	No
Phenol	26.28	No
Ammonia	166.4	No

Note: Knauf Fiber Glass considers all particulate matter as PM_{10}. Since PM_{10} emissions have more stringent limitations, all discussions in this permit application utilize PM_{10} rather than PM.
[a] PSD permit issued had a reduced PM_{10} limit.

After an extensive period of appeals, the PSD permit was issued three years later on March 22, 2000 with a reduced PM_{10} emission limit of 124.4 TPY (28.4 lb/hr). Construction of the facility commenced immediately and the plant began operation on February 4, 2002. Air emissions testing was completed in April and December 2002.

Based on oven exhaust gas and thermal oxidizer burner manufacturer's emission estimates, nitrogen oxides (NO_x) emissions from the facility were expected to be minor due to the use of low NO_x burners in the fiberglass curing oven and thermal oxidizers. As a result, NO_x was not formally evaluated under PSD in the original PSD permit application, but was evaluated in the California Environmental Quality Act (CEQA) Environmental Impact Report (EIR) and the required California Best Available Control Technology (BACT) analysis.

The results of the air emissions testing program demonstrated that the PM_{10} emission rate was equivalent to a level below 100 TPY. NO_x emissions test results demonstrated that the actual emissions resulted in a level that exceeded 40 TPY, but were less than 100 TPY.

1.4 Application for a Permit Modification

This permit application contains the necessary information for the U. S. Environmental Protection Agency (EPA or Agency), Region IX, to review the proposed permit modifications and perform the following actions:

1. Modify the original PSD permit for PM_{10} since total PM_{10} emissions are less than the 100 TPY PSD threshold. Authorize a total plant PM_{10} emission level of 99 TPY.

2. Authorize an increase in facility NO_x emissions from 24.8 TPY to 99 TPY.

3. Authorize an increase in PM_{10} emissions from the electric glass melting furnace to 1.0 pound per hour (increased from 0.1 to 1.0 lb/hr) which has been offset by lowering the manufacturing line PM_{10} emission rate.

4. Provide written guidance to the Shasta County Department of Resource Management, Air Quality Management District, to authorize the permit modifications at the local level.

2.0 PROJECT DESIGN

2.1 Process Description

The Knauf Shasta facility consists of one fiber glass insulation production line rated at 195 tons of molten glass per 24-hour production day. A process flow diagram is included as Figure 2.1-1, and the typical material handling flow diagram is included as Figure 2.1-2. Fiber glass manufacturing consists of the following processes:

1. Raw materials handling
2. Molten glass preparation
3. Fiber forming and binder application
4. Curing the binder-coated fiber glass mat
5. Cooling the mat
6. Facing
7. Cutting and packaging

2.1.1 Raw Materials Handling

The primary component of fiberized glass is silica sand, but it also includes granular quantities of soda ash, limestone, borax, dolomite, feldspar and other minor ingredients. The raw materials are received in bulk by rail car and truck. The bulk raw materials are unloaded from the trucks and rail cars by a mechanical conveying system to storage silos. All conveying and storage areas are enclosed.

From the storage areas, the materials are measured by weight according to the desired product recipe and blended prior to their introduction into the electrical glass melting furnace. The weighing, mixing and charging operations are conducted in batch mode.

Particulate matter (PM) is the only regulated pollutant which is generated by the raw materials handling operation. Emissions from the indoor dust collectors are insignificant and vent indoors. There is no ultimate vent point that leads to the atmosphere outside the building. Air is exhausted from these dust collectors only when batch raw materials or mixed batch is transported through the system. Proposed methods for controlling particulate matter from conveying and storage operations include enclosures and fabric filter dust collectors. All captured particulates are recycled back to the system.

The furnace batch day bins, containing mixed batch ready to be put into the furnace, are located next to the furnace and exhaust into the furnace/forming building. Negative pressure inside of this building prevents any emissions from these devices from exiting the building. Due to the extremely large volume of air exhausted through the forming section, a negative pressure is generated throughout the entire building. All fugitive emissions from the inside-vented dust collectors, raw material storage tanks, washwater storage, etc. pass through the forming section control devices prior to being discharged through the main stack. Any emissions from these sources are measured during emission tests on the main sack. To control fugitive emissions, all emissions from the mixing process and indoor venting are routed through the forming operation (via induced draft) and are included in the overall emission rates for the process.

2.1.2 Molten Glass Production

After introduction into the electric glass melting furnace, the raw materials are heated to a temperature of approximately 2,500 °F and transformed through a sequence of chemical reactions to molten glass. The proportions of the glass ingredients remain the same for the various products manufactured on the line. The raw materials are introduced continuously at the rear of the furnace where they are slowly mixed and dissolved.

Since all glass melting is done electrically (no fuel combustion), the only pollutant emitted by the glass melting furnace is particulate matter in trace amounts from the batch feeding process. The particulate emissions are controlled by two fabric filter baghouse dust collectors with 99+% removal efficiency.

2.1.3 Glass Fiber Forming and Binder Application

The rotary spin process is used in the Knauf facility production line to form glass fibers. In the rotary spin process, molten glass from the furnace is continuously poured into a rotating cylinder or spinner. Centrifugal force causes the molten glass to flow through small holes in the wall of the spinner. The emerging fibers are entrained in a high velocity air stream, and binder is applied to bond the fibers. Typically, the binder consists of a solution of phenol-formaldehyde resin, water, urea, organo silane, ammonium sulfate and ammonia.

The liquid phenol-formaldehyde resin is purchased and stored as a 50-55% solid concentration (45-50% water) and mixed with the other ingredients as needed. The resin dilution operation is a batch process. In the batch process the resin is diluted with water and other ingredients in vented mixing tanks and then stored for use. All emissions from the mixing and indoor venting are routed through the forming operation (via induced draft) and included in the overall emission rates for the forming operation.

The glass fibers are pulled onto a perforated flyte conveyer belt directly below the spinners by suction air from fans pulling air through the perforated conveyer belt. The fibers are collected on the conveyer to form a fiberglass mat. Each spinner contributes fiberized glass to the mat causing the mat to increase in thickness as it travels through the forming section. The thickness of the uncured fiber glass mat is controlled by the conveyer speed.

The quantity of binder solids sprayed onto the glass fibers is governed by the type of product being manufactured. Residential insulation is approximately 4% binder by weight, whereas metal building, duct wrap and flexible duct material are up to 10% binder by weight. Typically, about

85% of the binder applied to the fiber glass remains on the product (referred to as binder application efficiency); the remainder is exhausted with the forming or curing oven air to an air pollution control device, or remains on the conveyer.

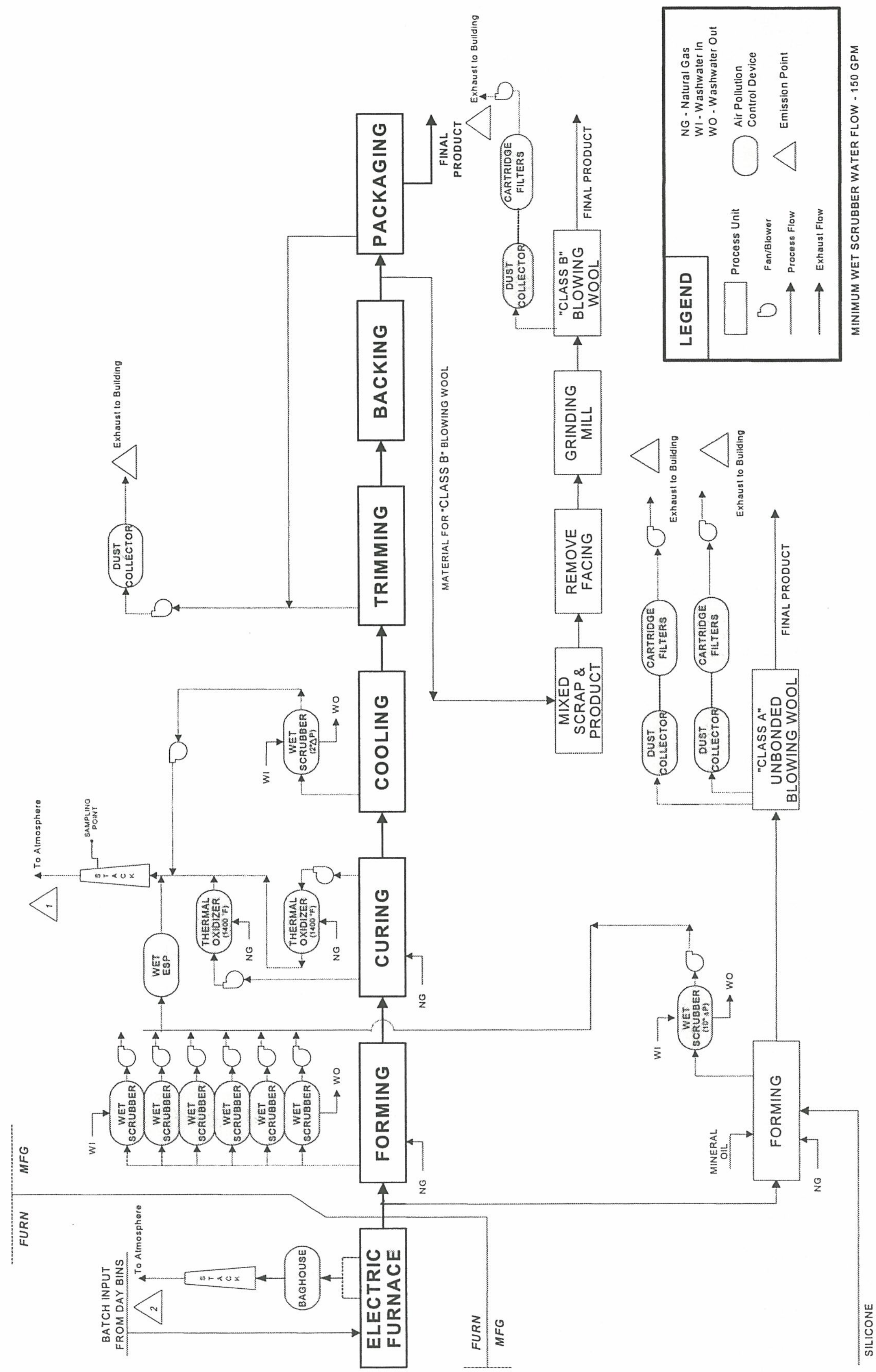

Figure 2.1-1. Process Flow Diagram for Knauf Fiber Glass.

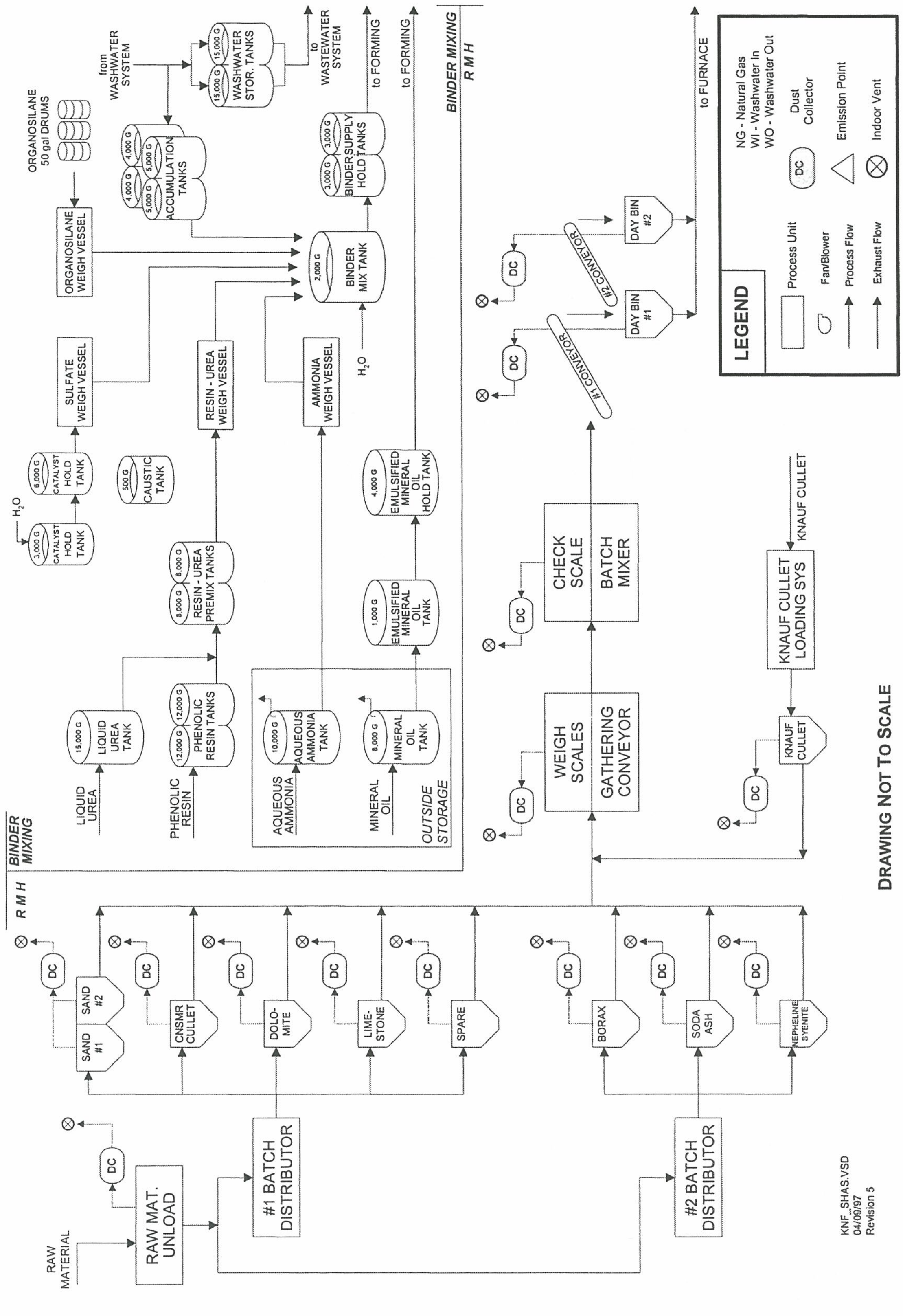

Figure 2.1-2. Typical Material Handling Flow Diagram.

Quality control checks will be routinely performed by plant personnel to determine the loss on ignition (LOI) of the product. The LOI check insures that the correct weight percent of binder is present in the product. To determine the LOI, a sample of the product is weighed, ignited to remove the binder and reweighed.

The fiber glass from several of the rotary spinners is diverted without binder application to a processing area to be packaged as unbonded blowing wool insulation.

The regulated pollutants which are emitted from the forming and binder application section are reactive organic gases (ROGs)/volatile organic compounds (VOCs) and PM, 90% to 95% of which are organic solids and the balance of which are inorganic solids and minute amounts of entrained glass fibers. Carbon monoxide (CO), NO_x, and trace amounts of sulfur dioxide (SO_2) are also emitted from the combustion of natural gas. The exhaust stream from the forming sections is sent through wet venturi scrubbers and a wet electrostatic precipitator prior to entering the stack.

2.1.4 Curing the Binder-Coated Fiber Glass Mat

After the mat is formed, it continues on the conveyer to the curing oven. Upper and lower perforated flytes in the oven compress and cure the fiber glass mat to the desired final thickness. The clearance between the flytes may be adjusted for different products.

The purpose of the curing oven is to drive off the moisture remaining on the fibers and cure the binder. The oven has six (6) zones, plus two (2) vestibule burners to maintain temperature. Each zone has its own low NO_x burner and blower to recirculate the hot air through the mat. An illustration of the curing oven is shown in Figure 2.1-3. The oven burners are Maxon Model 3.7M low NO_x burners. Each of the eight oven burners is rated at 3.7 million Btu per hr (MMBtu/hr; High Heating Value basis), with a NO_x emission rate of 0.034 lb/MMBtu. The normal operating rate per burner is 40% of capacity, or 1.5 MMBtu/hr.

The oven temperature ranges from 450 °F to 500 °F. Hoods are at the entry and exit of the oven to capture the exhaust from the oven.

The regulated pollutants emitted from the curing oven are particulate matter and reactive organic gasses from heating the binder, and NO_x, SO_2, and CO from the natural gas combustion burners. These pollutants are sent through two (2) thermal oxidizers prior to entering the main stack as shown in Figure 2.1-3. A thermal oxidizer is the best available control device for the destruction of VOCs contained in the binder. The thermal oxidizers are Maxon Kinedizer Model 18M rated at 18 million Btu/hr. The normal operating level is between 60 and 70%, or 10.8 to 12.6 million Btu/hr. Typical destruction efficiencies exceed 90% at a thermal oxidizer outlet temperature of 1400 °F.

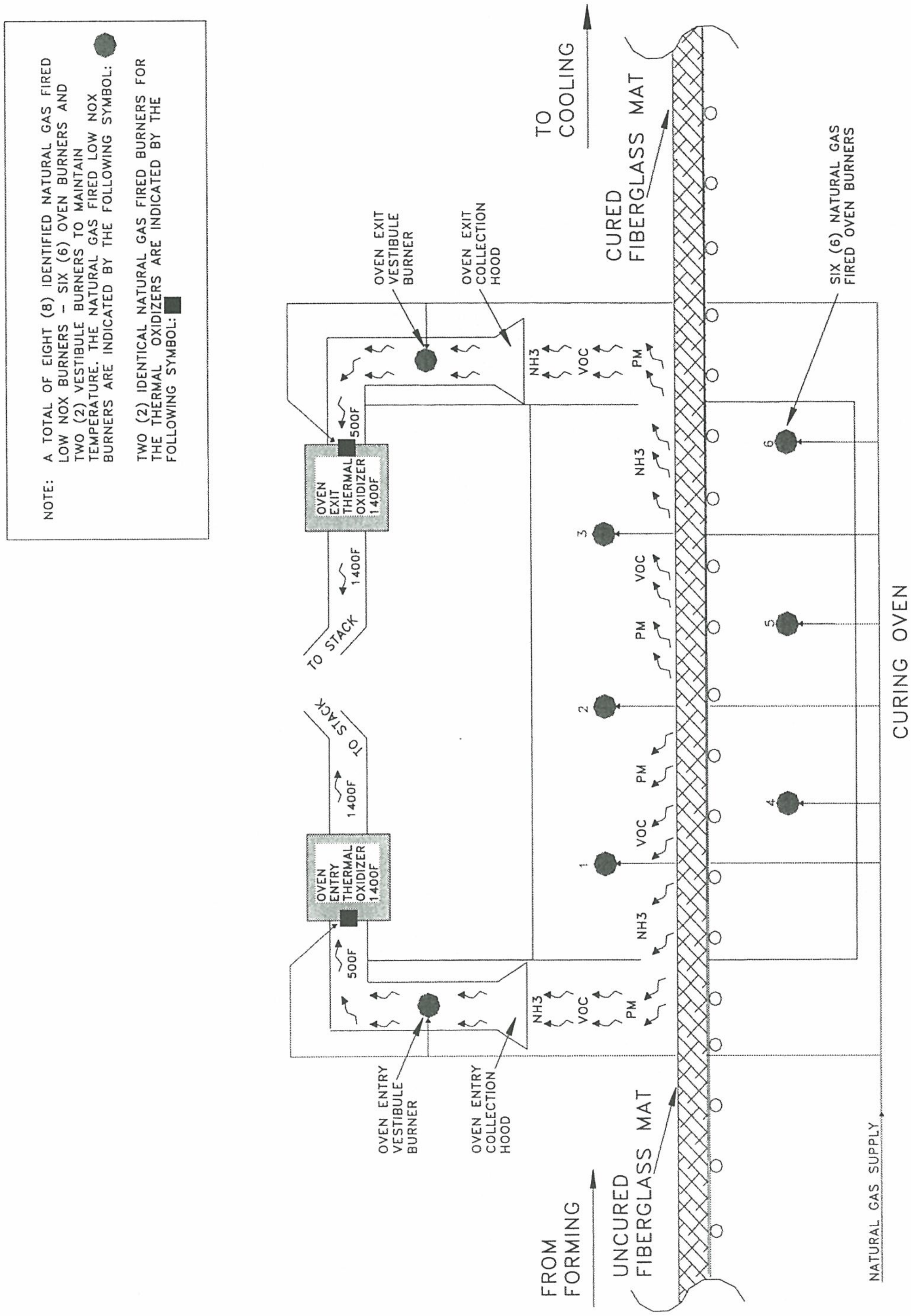

Figure 2.1-3. Curing Oven with Thermal Oxidizers.

As stated in Section 2.1-3, the binder contains ammonia and urea. Some free ammonia is present and enters the curing oven. In addition, during the curing process, ammonia is one of the byproducts that are driven off during the thermal decomposition of urea. As this ammonia passes through the thermal oxidizers operating with a minimum outlet temperature of approximately 1400 °F, some of the free ammonia is converted to additional NO_x as follows:

$$4NH_3 + 7O_2 \rightarrow 4NO_2 + 6H_2O$$

$$4NH_3 + 4O_2 \rightarrow 2N_2O + 6H_2O$$

$$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$$

The magnitude of the NO_x created by the ammonia oxidation was not known at the time the original PSD permit application was filed for this facility.

2.1.5 Cooling the Mat

After the mat has been cured, it passes over a cooling section where ambient room air is induced through the mat. The regulated pollutants emitted from the cooling section are minor amounts of PM and ROG. The exhaust from the cooling section exits through the common stack.

2.1.6 Facing

An asphalt adhesive precoated paper facing is heated and pressed against the cooled mat for some of the insulation products. A water-based adhesive is also used to glue facings to some products.

2.1.7 Cutting and Packaging

Just prior to the facing section of the line, the mat edges are trimmed and cut. The trimmed edge waste is recycled using an air conveyer system back to the forming section to be included with the mat being formed.

The dust that develops during the cutting and packaging operations is collected with an air evacuation system and filtered with a fabric filter dust collector system.

Blowing wool is sent through a separation system that removes the wool from the blown air stream and packages it.

2.2 Operating Schedule

This permit application is for continuous operation of the Knauf Shasta facility (8760 hours/year).

2.3 Plant Emissions

Authority to Construct and New Source Review (NSR) regulations require a determination of the source's potential to emit (PTE), which is the maximum capacity of a stationary source to emit air pollutants under its physical limitations and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, provided the limitation is enforceable, is to be treated as part of its design. The emission rates presented in this section are based on maximum plant operations.

2.3.1 Air Pollutants

The following PTE emission rates are based on 195 tons of molten glass being produced per day (8.13 tons/hr). The major source of air pollutants at the facility comes from the combined stack for the forming, oven, and cooling operations. The PTE emission rates for all pollutants from the combined forming, oven, and cooling are listed in Table 2.3-1.

The basis for the PTE rates are the currently permitted limits at 8,760 hours of operation, with the exception of PM_{10} and NO_x, which are the values listed in this application. Emission calculations can be found in Appendix A for PM_{10} and NO_x.

Table 2.3-1. Manufacturing Line (Forming, Oven and Cooling) Stack PTE Emissions.

Pollutant	lb/hr	tons/yr (TPY)
PM_{10} (particulate matter less than 10 microns in size)	21.6*	94.6
NO_x	22.6*	99.0
SO_2	1.0	4.4
CO	22.3	97.7
ROG (includes Formaldehyde and Phenol)	9.0	39.4
Formaldehyde	2.0	8.8
Phenol	6.0	26.3
Ammonia	38.0	166.4

* Change from original PSD application.

PM_{10} emissions also exhaust from a dust collector associated with the electric glass melting furnace. The total plant PTE emission rates are given in Table 2.3-2.

Table 2.3-2. Total Plant PM_{10} Emissions.

Emission Source	lb/hr	TPY
Combined Forming/Oven/ Cooling Stack	21.6	94.6
Electric Glass Melting Furnace Dust Collector	1.0	4.38
Total PM_{10} Emissions	**22.6**	**99.0**

3.0 APPLICABLE REGULATORY REQUIREMENTS

This section discusses the applicable regulatory requirements for submitting an Air Permit Modification for the proposed Knauf facility in Shasta Lake, California. Although Knauf is modifying the PSD permit to below PSD thresholds, this modification includes a discussion of PSD regulations and this application conservatively addresses PSD concerns.

3.1 New Source Review (NSR)

The Clean Air Act (Act) requires that new major stationary sources of air pollution, or major modifications of existing sources, obtain air pollution permits and/or approvals prior to commencing construction. Sources located in attainment areas (areas where all National Ambient Air Quality Standards (NAAQS) have been met) are required to perform NSR for compliance with NAAQS and PSD requirements. These preconstruction review programs for the Knauf Shasta facility were originally processed by the Shasta County Air Quality Management District. On March 3, 2003, this delegation was removed and the issuance of PSD permits for Shasta County is now performed by EPA Region IX.

PSD regulations are promulgated in federal regulations under Title 40, *Code of Federal Regulations*, Part 52.21 (40 CFR 52.21). The PSD program is designed to ensure that air quality will not significantly deteriorate in areas where the NAAQS are being met. The PSD regulations specify that any major new stationary source or major modification to an existing major source within a NAAQS attainment area must undergo a PSD review and obtain all applicable federal and state preconstruction permits prior to commencement of construction.

3.1.1 PSD Applicability

A stationary source, whether a proposed new source or an existing source, is considered major if it is:

- One of the 28 named source categories listed in Section 169 of the Act and emits, or has a PTE of 100 TPY or more of any air pollutant regulated by the Act or,
- Is an unlisted stationary source that emits or has the PTE of 250 TPY or more of any air pollutant regulated by the Act.

Glass fiber processing plants are one of the 28-named PSD source categories. The Knauf Shasta facility is subject to the 100 TPY PSD threshold. Once the PSD applicability threshold is exceeded for any pollutant, the regulated individual air pollutant emissions are compared to the significant emission levels listed in Table 3.1-1. If the air pollutant exceeds the significant emission level, then a PSD review applies to that pollutant.

Table 3.1-1. Significant Pollutant Emission Rates Once PSD Has Been Triggered.

Pollutant	Emission Rate (TPY)
Carbon monoxide	100.0
Nitrogen oxides	40.0
PM (total suspended particulates)	25.0
PM_{10}	15.0
Sulfur dioxide	40.0
Ozone, as Volatile Organic Compounds (VOC), also Reactive Organic Gases (ROG) in Shasta County	40.0
Lead	0.6
Mercury	0.1
Beryllium	0.0004
Asbestos	0.007
Fluorides	3.0
Sulfuric acid mist	7.0
Vinyl chloride	1.0
Hydrogen sulfide	10.0
Total reduced sulfur (including H_2S)	10.0
Reduced sulfur compounds (including H_2S)	10.0
Benzene	0
Inorganic arsenic	0
Radionuclides	0

Note: All PM is considered to be PM_{10}.

A comparison of the PTE emission rates for the Knauf facility, in contrast to the PSD significant emission thresholds, is given in Table 3.1-2. The results indicate that PSD review should not be required for any air pollutants since no single air pollutant exceeds 100 TPY.

Table 3.1-2. Knauf Shasta Facility Annual Emissions.

Pollutant	Knauf Plant, TPY	PSD Threshold If Any One Criteria Air Pollutant Exceeds 100 TPY	PSD Applicability for This Permit Modification
PM_{10}	99.0	15.0	No
NO_x	99.0	40.0	No
SO_2	4.4	40.0	No
CO	97.7	100.0	No
ROG (includes Formaldehyde and Phenol)	39.4	40.0	No
Formaldehyde	2.0	N/A	No
Phenol	6.0	N/A	No
Ammonia	38.0	N/A	No

Note: All PM is considered to be PM_{10}.

3.1.2 PSD Requirements

If a PSD review is triggered, the PSD regulations require the following analyses to be performed for the facility for each pollutant that exceeds the significant emission rates:

1. A BACT analysis to determine which control strategy and equipment is most appropriate for the plant being constructed.

2. An air quality impacts analysis to demonstrate that each significant emission increase resulting from the proposed emissions will not cause or contribute to a violation of any allowable increment or NAAQS.

3. An additional impacts analysis to determine the effects of the emission increase on soils, vegetation, visibility, and each potentially affected Class I area and the surrounding areas as a result of induced growth.

3.1.3 Air Quality Standards

For areas that are in attainment with the NAAQS, maximum allowable increases or "increments" in ambient pollution concentrations have been established for PM_{10}, NO_x, and SO_2. These PSD increments are presented in Table 3.1-3, along with the CARBAQS, Significant Impact Levels (for modeling purposes), and 8-hour Personal Exposure Limits (PEL). The PSD increments are an absolute ceiling, stated as the maximum allowable increases in concentration of the pollutant over a baseline concentration. In effect, the PSD increments, when added to baseline concentrations represent new ambient air quality levels for PSD areas.

Table 3.1-3. Air Quality Standards.

Pollutant	Averaging Period	NAAQS ($\mu g/m^3$)	CARBAQS ($\mu g/m^3$)	PSD Increment ($\mu g/m^3$)	Significant Impact Levels ($\mu g/m^3$)	PEL ($\mu g/m^3$)
Ozone	1-Hour	235	175	-	-	-
PM_{10}	Annual	50	30	17	1	-
	24-Hour	150	50	30	5	-
NO_x	Annual	100	-	25	1	-
	1-Hour	-	500	-	-	-
SO_2	Annual	80	-	20	1	-
	24-Hour	365	105	91	5	-
	3-Hour	1,300	-	512	25	-
	1-Hour	-	655	-	-	-
CO	8-Hour	10,000	10,000	-	500	-
	1-Hour	40,000	23,000	-	2000	-
Form-aldehyde	8-Hour	-	-	-	-	2,000
Phenol	8-Hour	-	-	-	-	19,000
Ammonia	8-Hour	-	-	-	-	18,000

3.2 New Source Performance Standards

New Source Performance Standards (NSPS) are nationally uniform emission standards established by the EPA and set forth in 40 CFR 60. NSPS apply to every qualifying new source and are based on pollution control technology available to the category of source. Federal NSPS provide a starting point to evaluate required controls; however, the BACT analysis specifies the type of control technology required.

The Knauf facility is required to comply with the NSPS for glass fiber manufacturing. Since the electric glass melting furnace is exempt from the NSPS in 40 CFR 60, Subpart CC (no fuel combustion), only 40 CFR 60, Subpart PPP is applicable.

40 CFR 60, Subpart PPP sets an emission limit on rotary spin wool fiber glass insulation manufacturing lines of 5.5 kg per Mg of glass pulled (11 lb/ton). The term "manufacturing line" is defined by Subpart PPP to include the forming, curing, and cooling sections of the process.

3.3 Best Available Control Technology (BACT)

The PSD process requires an evaluation of emission control devices and techniques demonstrating that BACT will be applied to the source. The BACT evaluation ensures that technically feasible control technologies are evaluated and that air pollutant emissions are mitigated while limiting the impacts on available energy, the economy, and the environment within an affected area. This analysis ultimately determines the allowable emissions from a source and is the basis for demonstrating emission rates, ambient air impacts, and compliance with applicable regulations. The application of BACT must result in emissions which comply with the federal, state and local ambient impact standards. BACT is defined in 40 CFR 52.21 as:

> "...an emissions limitation based on the maximum degree of reduction, which the Agency, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source through application of production process and available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of each pollutant."

A full BACT analysis ranks all feasible and available control technologies in descending order of control effectiveness. The most stringent or "top" alternative for comparable facilities is examined first. This alternative is established as BACT unless the applicant demonstrates that due to other considerations such as technical, energy, environmental, or economic reasons, it can be justified that a less stringent control technology is appropriate. If the most stringent technology is eliminated, then the process is repeated for the next most stringent alternative and so on.

To comply with the PSD requirements for BACT, the Knauf facility demonstrated BACT for PM_{10} emissions in the original application in 1997. Although the facility is no longer a PSD source, this permit modification evaluates BACT for NO_x due to the increase from 24.8 to 99 TPY.

In addition to satisfying BACT in the PSD requirements, the Knauf facility must also satisfy BACT as defined in Section 205 of Shasta County Air Quality Management District Rules and Regulations. In Section 205, BACT is defined as the most stringent of one of the following:

- The most effective emission control device, emission limit, or technique that has been required or used for the type of equipment comprising such emission unit unless the applicant demonstrates to the satisfaction of the Air Pollution Control Officer (APCO) that such limitations are not achievable.

- Any other emission control device or technique, alternative basic equipment, different fuel or process, determined to be technologically feasible and cost-effective by the APCO. The cost effective analysis shall be performed in accordance with the methodology specified by the APCO.

- Under no circumstances shall BACT be determined to be less stringent than the emission control required by any applicable provision of District, State, of federal laws or regulations, unless the applicant demonstrates to the satisfaction of the APCO that such limits are not achievable.

3.4 Air Quality Impact Analysis

The Knauf Shasta project must demonstrate the air quality impact of the project with both NAAQS and the CARBAQS. Air Quality Impact Assessments (AQIA) are performed using dispersion modeling techniques in accordance with the EPA's "Guidelines on Air Quality Models."

As part of the AQIA, a determination is made as to whether or not the impacts from the facility emissions are high enough to trigger a requirement for ambient air quality monitoring. The *de minimis* impact level for particulates, over a 24-hour averaging period, is 10 micrograms per cubic meter ($\mu g/m^3$). If the air quality impact exceeds this value, ambient air quality monitoring would be required to establish baseline air quality data. However, a source may qualify for a waiver from the ambient air quality monitoring requirements if existing monitoring data, representative of the area, is readily available. Ambient air quality monitoring data for particulates, as well as other pollutants, from the Redding, California monitoring station is considered representative for the City of Shasta Lake (Michael Kussow, 1996).

3.4.1 Federal Ambient Air Quality Standards

The National Ambient Air Quality Standards (NAAQS) were established by the United States Environmental Protection Agency to protect public health and welfare. Federal air quality standards have been set for ozone, CO, nitrogen dioxide (NO_x), SO_2, lead (Pb), and particulates (PM_{10}). The federal Clean Air Act provides that NAAQS can be exceeded no more than once each year. Areas that exceed the standard four times in three years or more can be considered "nonattainment areas" subject to more stringent planning and pollution control requirements. The NAAQS values are presented in Table 3.1-3.

3.4.2 State Ambient Air Quality Standards

The State of California has established its own ambient air quality standards, to protect public health and welfare and to prevent the significant deterioration of air quality. They are administered by the California Air Resources Board (CARB). The state has set its own standards for all NAAQS standards, as well as for hydrogen sulfide and vinyl chloride. The CARBAQS that have been established are more restrictive than the accompanying federal standards. The CARBAQS values are also presented in Table 3.1-3.

Both state and federal air quality standards consist of two parts: an allowable concentration of a pollutant and an averaging time over which the concentration is to be measured. Allowable concentrations are based on the results of research studies of how pollutants affect human health, crops, and vegetation; potential damage to paint and other materials is also considered. The averaging times are based on whether the damage caused by the pollutant is more likely to occur during exposures to a high concentration for a short period of time (e.g. one hour), or to a relatively lower average concentration over a much longer period (e.g. one year). For certain pollutants, there may be several air quality standards reflecting both short- and long-term effects.

3.4.3 Shasta County Standards

Shasta County currently meets all of the NAAQS federal standards. However, the County is non-attainment for the state standards for PM_{10} and ozone, meaning that there has been at least one violation of the state standard for these pollutants in Shasta County.

In addition to the Shasta County monitoring stations located in Redding and Anderson, a special purpose PM_{10} ambient air quality monitoring station has been operating near the Knauf facility since January 2001. According to data collected at this site, the state standard has been violated once over the two-year monitoring period. This violation can be attributed to forest fires in Northern California and Oregon during the summer of 2002. With the exception of the one violation, monitored PM_{10} levels have remained below the state standard.

During the summer of 2000, the District participated in a statewide ozone study, which included the monitoring of oxides of nitrogen (NO_x) concentration in Shasta County. The monitoring station was located less than ten miles from the Knauf facility in the town of Bella Vista. Data from this study indicates that state and federal NO_x standards are not being violated.

A summary of the Shasta County ambient pollutant concentrations (background levels) compared to their CARBAQS values is shown in Table 3.4-1.

Table 3.4-1. Shasta County Local Ambient Air Quality Levels.

Pollutant	Averaging Period	CARB Ambient Air Quality Standards ($\mu g/m^3$)	Shasta County Background Levels ($\mu g/m^3$)[5,6,7,8]
PM_{10}	Annual	20	13.7
	24-Hour	50	37.4
NO_x	Annual		1.5
	1-Hour	470	92.0

The Part 300 requirements of the Air Quality Management District, Rules and Regulations, requires the use of BACT for any new emission unit for any pollutant that exceeds the values in Table 3.4-2.

Table 3.4-2. Part 300 BACT Thresholds.

Pollutant	lb/day	TPY
Reactive organic gases	25.0	4.56
Nitrogen oxides	25.0	4.56
Sulfur oxides	80.0	14.6
PM_{10}	80.0	14.6
Carbon monoxide	500.0	91.25

3.5 Good Engineering Practice Stack Height

The EPA has established a Good Engineering Practice (GEP) stack height policy that limits the use of dispersion enhancement due to extremely tall stacks. The regulation does not limit the physical stack height, but rather limits the height of a stack that can be used in the dispersion modeling study. GEP stack height is defined as 65 meters (213 feet), or (H+ 1.5L), where H is building height and L is the lesser dimension of the height or projected width of the building.

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[5] PM_{10} ambient air quality data from City of Shasta Lake Animal Shelter monitoring station, data taken from 1/1/2001 to 2/14/2003

[6] 24 hour PM_{10} background concentration listed is second high over monitoring period due to maximum being caused by forest fires in California and Oregon during the summer of 2002 (56.3 ug/m^3)

[7] NOx ambient air quality data from Bella Vista, CA Ozone Study performed by CARB in 2000

[8] Value provided for annual NO_x background concentration is average value from 45 day sampling period

For example, if the building height (H) is 50 feet, and the projected width is 200 feet, then L is 50 feet and the GEP height is (50 + 1.5*50), or 125 feet. Therefore, the GEP height is calculated to be 125 feet, but a stack height up to 213 feet (65 meters) can be built and the entire height will be allowed for modeling purposes.

Another example for a GEP height above 213 feet is as follows. If the GEP stack height is determined to be 220 feet, one can still build a stack that is 300 feet tall but the mathematical modeling of the plant can only take credit for a physical stack height of 220 feet.

A stack height shorter than GEP is allowable by the regulations, but the AQIA modeling study must consider the aerodynamic downwash effects of structures on the dispersion of air pollutants (discussed later).

3.6 Hazardous Air Pollutants

A major emission source for hazardous air pollutants (HAP) is defined as a source that emits more than 10 TPY of any one of the listed HAPs, or an aggregate to HAPs that exceeds 25 TPY. The Knauf Fiber Glass facility is a major HAP emission source and is subject to the applicable Maximum Achievable Control Technology (MACT) standards. The National Emission Standard for Hazardous Air Pollutants (NESHAP) for Wool Fiberglass Manufacturing was promulgated on June 14, 1999. This rule established a PM limit (a surrogate for arsenic, chromium, and lead) of 0.5 lb/ton of glass pulled from the glass furnace. The NESHAP also established a formaldehyde emission limit (a surrogate for phenol and methanol) of 0.8 lb/ton of glass pulled for new rotary spin manufacturing lines.

Sources of hazardous air pollutants are also evaluated at the state level. The State of California has set 8-hour permissible exposure levels (PEL) for a number of hazardous air pollutants. The PEL values for formaldehyde, phenol, and ammonia are given in Table 3.1-3.

In addition to the comparison to PEL values, CARB developed regulations for Assembly Bill (AB) 2588, the Air Toxics Hot Spots Information and Assessment Act of 1987. Facilities that exceed certain thresholds for hazardous air pollutant emissions are subject to AB 2588 requirements. AB 2588 requires facilities to report their emissions of toxic air contaminants. Facilities are subsequently prioritized by their emissions, and "high priority" facilities are required to conduct a health risk assessment.

The Knauf facility emits phenol, formaldehyde, and ammonia at levels which require evaluation under AB 2588. An evaluation of the air toxics emission rates will be completed in August, 2003. This study will evaluate human health risks calculated with health risk factors provided by the California Air Pollution Control Officers Association (CAPCOA, 1993). The risk factors were developed based on available data on human and animal exposure. Safety factors have been incorporated into the risk factors to protect human health.

Incremental cancer risk represents a person's increased chance of contracting cancer after living at the point of maximum concentration continuously for 70 years. The incremental cancer risk level considered to be significant by Shasta County is 1×10^{-5}, or 1 in 100,000.

A chronic hazard index is a ratio of the toxic air contaminant's concentration at the level at which noncarcinogenic health effects may occur after long-term exposure. A hazard index greater than 1.0 indicates that adverse health effects could occur. The evaluation is performed using the maximum five-year average pollutant concentrations predicted by dispersion modeling.

An acute hazard index is a ratio of a toxic air contaminant's concentration to the level at which noncarcinogenic health effects may occur after short-term exposure. Once again, a hazard index greater than 1.0 indicates that adverse health effects could occur. The evaluation is performed using the maximum one-hour average pollutant concentrations predicted by dispersion modeling.

3.7 Soils and Vegetation

The PSD program requires an evaluation of the project's air pollution impacts on soil and vegetation. After the completion of air quality modeling, an assessment of the impacts of pollution in the project area can be performed by correlating the modeling results with established "harmful effects" levels. For most types of soils and vegetation, air quality impacts below the NAAQS will not result in harmful effects. A soil and vegetation analysis is presented in Section 9.

3.8 Class I Area Impact Analysis

PSD increments have also been established for air quality in federal Class I areas. These levels are more stringent than the normal NAAQS presented in Table 3.2-1. For PM_{10}, the Class I increment is 4 $\mu g/m^3$ for annual averages, and 8 $\mu g/m^3$ for 24-hour averages. For NO_x, the Class I increment is 2.5 $\mu g/m^3$ for an annual average, never to be exceeded. Although the Knauf facility is no longer a PSD source, a Class I area impact analysis is addressed presented in Section 10.

For PSD sources, an applicant is also required to demonstrate that the emissions from the source(s) will not cause or contribute to adverse impacts to Air Quality Related Values (AQRV) in any Class I area. The study evaluates the potential for impacts on sensitive receptors in the Class I areas, and needs to demonstrate that the acceptable limits of air pollution-caused changes (LAC) are not exceeded. The guidelines that are followed for Class I impact studies include the Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I report from December, 2000, the Interagency Workgroup on Air Quality Modeling (IWAQM) Phase II Summary Report and Recommendations for Modeling Long Range Transport Impacts, issued in December, 1998, and 40 CFR 51, Revision of the Guideline on Air Quality Models: Adoption of a Preferred Long Range Transport Model and Other Revisions; Final Rule, published April 15, 2003.

3.9 Visibility

An analysis of visibility impairment is required at Class I land use areas as part of the PSD permitting process. Class I areas are national park and wilderness areas with more stringent air quality standards. EPA regulations define visibility impairment as any humanly perceptible change in visibility (visual range, contrast, or coloration) from natural conditions. To determine if a source will impair visibility at a federal Class I area, the EPA and Federal Land Managers require the use of the EPA's CALPUFF model to demonstrate that its emissions will not impair visibility inside any Class I area. Although the Knauf Shasta facility is no longer a PSD source, a visibility analysis for the Knauf Shasta facility is addressed in Section 10.

3.10 Direct Growth Analysis

The PSD program requires an analysis of the anticipated growth in an area and subsequent air quality impacts associated with growth as a direct result of the project. Since this evaluation was covered in detail in the Environmental Impact Report for the Knauf Fiber Glass plant as part of the CEQA process, Knauf hereby incorporates the EIR growth analysis by reference.

3.11 Endangered Species Evaluation

Under Section 7 of the Endangered Species Act, impacts of a PSD project on endangered and threatened species and their habitats must be adequately assessed. Since this evaluation was covered in detail in the Environmental Impact Report for the Knauf Fiber Glass plant as part of the CEQA process, Knauf hereby incorporates the EIR endangered species analysis by reference.

4.0 EMISSION STANDARDS

The Knauf facility must demonstrate compliance with the applicable NSPS Subpart PPP for fiber glass manufacturing. The controlled particulate emissions from the rotary spin wool fiber glass operation, including the condensable organics, will be 21.6 lb/hr for a production rate of 195 ton/day. This equates to 2.7 lb/ton for manufacturing and easily complies with the 11 lb/ton NSPS limit. Since the electric glass melting furnace is exempt from the NSPS in 40 CFR 60, Subpart CC (no fuel combustion), only 40 CFR 60, Subpart PPP is applicable.

The MACT standard for glass melting (see Section 3.6) is 0.5 lb PM per ton of glass pulled. Although the MACT standard allows 4.1 lb/hr, the Knauf PSD/ATC permit limit will be 1.0 lb/hr at 195 tons of glass pulled per day, which equates to 0.123 lb/ton of glass pulled.

The MACT standard for new rotary spin fiberglass manufacturing lines is 0.8 lb of formaldehyde per ton of glass pulled. Although the MACT standard allows 6.5 lb/hr, the Knauf PSD ATC permit limit is 2.0 lb/hr at 195 tons per day, which equates to 0.25 lb/ton of glass pulled.

5.0 BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS

Based on the potential to emit emission rates for the Knauf facility shown in Table 3.1-2, and the Part 300 BACT thresholds of Table 3.5-1, the following pollutants would require a BACT analysis:

- PM_{10}
- Nitrogen oxides
- Carbon monoxide
- Reactive organic gases

No further evaluation has been prepared for PM_{10} since the emission rates for PM_{10} have decreased from the original PSD permit approval. Likewise, no further BACT analysis has been prepared for carbon monoxide and reactive organic gases because emission limits have not changed.

The only air pollutant to increase is NO_x from the manufacturing line, and therefore, this BACT analysis covers an update for NO_x emissions from the manufacturing line.

5.1 BACT Analysis – Manufacturing Line NO_X

Emissions from the manufacturing line at the Knauf Shasta facility consist of condensed and uncondensed PM_{10}, as well as ROG from the binder. The combustion of natural gas in the forming fiberizers and the low NO_x oven burners results in emissions of NO_x, SO_2, CO, ROG, and trace amounts of PM_{10}.

The facility has been constructed with thermal oxidizers to control emissions of ROG and condensable particulates from the curing oven. Thermal oxidizers are very effective at the reduction of ROGs. However, as discussed in Section 2.1.4, the combustion of natural gas in the eight (8) oven burners and two (2) thermal oxidizer burners results in NO_x emissions. These emissions are minimized through the use of low NO_x burners. Unfortunately, the thermal curing of binder results in a release of ammonia (see Figure 2.1-3). A portion of this ammonia is converted to NO_x as it passes through the thermal oxidizers and greater than 50% of the NO_x emitted is associated with this process.

Virtually all NO_x emissions produced by natural gas combustion originates as NO. This NO is further oxidized in the exhaust system or later in the atmosphere to form the more stable NO_2 molecule. There are two mechanisms by which NO_x can be formed in the high temperature region (>2,500 °F) in and around the burner flame: 1) the oxidation of atmospheric nitrogen found in the combustion air (thermal NO_x and prompt NO_x), and 2) the conversion of nitrogen chemically bound in the fuel (fuel NO_x). These mechanisms are discussed in the following paragraphs.

Thermal NO_x is formed by a series of chemical reactions in which oxygen and nitrogen present in the combustion air dissociate and subsequently react to form oxides of nitrogen. The major contributing chemical reactions are known as the Zeldovich mechanism. Simply stated, the Zeldovich mechanism postulates that thermal NO_x formation increases exponentially with increases in temperature and linearly with increases in residence time. Flame temperature is dependent on the air/fuel ratio. A stoichiometric ratio is the point at which a flame burns at its highest theoretical temperature.

Prompt NO_x, a form of thermal NO_x, is formed in the proximity of the flame front as intermediate combustion products, such as HCN, N, and NH, are oxidized to form NO_x. Prompt NO_x is formed in both fuel rich flame zones and in fuel-lean combustion zones typical of some low-NO_x burner designs. The contribution of prompt NO_x to overall NO_x emissions is relatively small in conventional burners. This contribution is an increasingly significant percentage of overall thermal NO_x emissions in low-NO_x burners.

Fuel NO_x is formed when fuels containing nitrogen are burned. Molecular nitrogen, present as N_2 in some natural gas and propane, does not contribute significantly to fuel NO_x formation. The nitrogen content of liquid and solid hydrocarbon fuels, such as diesel oil and coal, can range from 0.1 to 2.0 percent by weight. When these fuels are burned, the nitrogen bonds break and some of the resulting free nitrogen oxidizes to form NO_x. With excess air, the degree of fuel NO_x formation is primarily a function of the nitrogen content in the fuel. The fraction of fuel-bound nitrogen (FBN) converted to fuel NO_x decreases with increasing nitrogen content, although the absolute magnitude of fuel NO_x increases. For example, a fuel with 0.01 percent nitrogen may have 100 percent of its FBN converted to fuel NO_x, whereas a fuel with a 1.0 percent FBN may have only 40 percent conversion rate. Natural gas contains essentially no FBN. As a result, when compared to thermal NO_x, fuel NO_x is not a significant contributor to overall NO_x emissions from curing oven burners.

Two potential post combustion NO_x control technologies include Selective Catalytic Reduction (SCR) and Selective Non-Catalytic Reduction (SNCR).

SCR involves the injection of ammonia into an exhaust gas stream at a temperature range of 600 to 900 °F that then passes through a precious metal or zeolite catalyst bed. The two primary NO_x reduction reactions, in the presence of a catalyst, are:

$$4NH_3 + 4NO + O_2 \quad 4N_2 + 6H_2O$$

$$4NH_3 + 2\,NO_2 + 2NO \rightarrow 4N_2 + 6\,H_2O$$

The fact that the thermal oxidizer generates most of the NO_x, plus the fact that the temperature exiting the thermal oxidizer is 1400 °F, makes an SCR a technically infeasible option for control.

SNCR involves the injection of ammonia or urea into an exhaust gas stream of approximately 1600 °F to 2000 °F temperature range. SNCR works most efficiently with elevated NO_x levels and a relatively long residence time of 1 to 2 seconds. Ammonia usage is greater than with SCR-based systems to achieve similar reductions. The low NO_x levels plus the 500 °F gas stream temperature upstream of the thermal oxidizers, and 1400 °F temperature leaving the thermal oxidizers, makes SNCR technically infeasible for the Knauf curing oven/thermal oxidizer exhaust.

Table 5.1-1 lists manufacturing line NO_x emission rates from other comparable new wool fiberglass manufacturing facilities in the United States. The Knauf Shasta NO_x level is the lowest comparable emission rate (lb/ton) of any wool fiberglass manufacturing plant equipped with thermal oxidizers, and is roughly one-third the level of the most recent PSD Permit level issued to the Johns-Mansville Plant in Winder, Georgia (1999). It should be noted that SCR and/or SNCR systems have never been utilized at any wool fiberglass manufacturing facility. The use of thermal oxidizers at the Knauf Shasta facility has the additional benefit of being extremely efficient at controlling condensable particulate matter and reactive organic gases.

Table 5.1-1 NO_x Control Technology for Wool Fiberglass Manufacturing Line.

Company/Location	Manufacturing Line NO_x Control Technology	NO_x Emission Limit	Comments
Knauf, Shasta Lake, CA	Low NO_x Burners (on oven & thermal oxidizers)	2.79 lb/ton of glass pulled (22.6 lb/hr, 99 tons/year)	Application for Air Permit Modification
Johns-Mansville, Winder, GA	Good combustion control	6.05 lb/ton of glass pulled	PSD Application and Title V Permit
Certainteed, Kansas City, KS[1]	Good combustion control (no thermal oxidizer on oven exhaust)	1 lb/ton of glass pulled	RBLC since no thermal oxidizer, VOC limits are over 50% greater than Knauf's

The Knauf Shasta facility concludes that the only feasible NO_x control option for the manufacturing line is the use of low NO_x burners to minimize the formation of NO_x during the combustion stage. BACT is considered to be the use of low NO_x burners. The benefits of the use of thermal oxidizers for control of organic emissions and condensable particulates outweigh the increased NO_x emissions resulting from the conversion of ammonia to NO_x as it passes through the thermal oxidizers.

6.0 AIR QUALITY IMPACT ANALYSIS

Although Knauf is modifying the PSD permit issued on March 22, 2000 to emission levels below PSD thresholds, an AQIA was performed to verify compliance with air quality standards. The primary objective of this analysis was to determine the worst-case ground-level impacts for comparison with the established air quality standards and other regulatory thresholds. If standards and thresholds are not exceeded under these worst-case conditions, then no exceedances are expected under any conditions.

6.1 Modeling Methodology

Impacts on ambient air quality from the Knauf facility were assessed using the ISC PRIME (Industrial Source Complex Plume RIse Model Enhancements) air quality dispersion model. This model includes COMPLEX I modeling capability for complex terrain and the PRIME algorithm for aerodynamic downwash determination. The ISC PRIME model is a versatile Gaussian dispersion model developed by EPA that is capable of assessing impacts from a variety of separate sources in regions of simple or complex terrain. The model is designed to evaluate a wide variety of sources within an industrial source complex. The ISC PRIME model can account for settling and dry deposition of particulates; area, line, and volume sources; plume rise as a function of downward distance; separation of point sources; and elevated receptors. The model is capable of estimating concentrations for a wide range of averaging times from one hour to one year. The ISC PRIME model also evaluates the impacts of multiple sources and sources over distances up to 31.25 miles (50 kilometers).

6.2 Emissions and Stack Parameters

The stack dimensions and exit parameters presented in Table 6.2-1 compare the originally submitted PSD model input parameters with revised input parameters.

Table 6.2-1 Stack Exit Parameters.

	Original PSD Modeling		Revised Modeling[1]	
Parameter	Forming Stack	Electric Furnace Dust Collector	Forming Stack	Electric Furnace Dust Collector
Stack Height, ft	200	85	199	85
Exit Temperature, deg F	190	175	137.7	115.3
Exit Diameter, ft	17	1.74	17	3.08
Flow Rate, ACFM	447,531	9,885	403,828	24,447
Exit Velocity, fps	32.9	69.29	29.7	54.7

[1] Revised exit parameters based on worst case emission test data

A comparison of originally proposed PSD emission limits and revised emission limits proposed with this submittal are given in Table 6.2-2.

Table 6.2-2 Emission Rates for ISC PRIME Modeling.

	Originally Proposed PSD Limits		Revised Emission Limits	
Pollutant	**Forming Stack**	**Electric Furnace Dust Collectors**	**Forming Stack**	**Electric Furnace Dust Collectors**
PM_{10} (lb/hr)	43.6	0.1	21.6	1.0
PM_{10} (ton/yr)	191.0	0.4	94.6	4.4
NO_x (lb/hr)	5.7		22.6	
NO_x (ton/yr)	24.8		99	

6.3 Meteorology and Terrain Data

6.3.1 Meteorological Data

Meteorological data for the modeling was based on five (5) years of hourly surface data from the Redding airport, from 1987-1991. Concurrent upper air mixing height data was obtained from the nearest available source in Medford, Oregon. Data from Redding and Medford were used in this analysis because, when compared with other meteorological stations providing data in compatible formats, they provide the most representative meteorological data for the Knauf facility location. The data was pre-processed for input into the ISC PRIME dispersion model. A summary of the meteorological data for the five years can be found in Appendix B.

6.3.2 Terrain

The terrain surrounding the Knauf Shasta site is considered complex, which is characterized by terrain features above the effective stack height of the forming stack. Since complex terrain modeling was required, digitized terrain in 30-meter increments out to 48 kilometers in each direction from the plant was obtained from the United States Geological Survey.

6.4 Receptor Grids

The Knauf facility was modeled out to 2.6 kilometers in each direction with a 100-meter rectangular grid, to 5 kilometers in each direction with a 200-meter grid, to 10 kilometers in each direction with a 500-meter grid, and 45 kilometers in each direction with a 5000-meter grid. A diagram of the receptor grid near Knauf can be found in Figure 6.4-1.

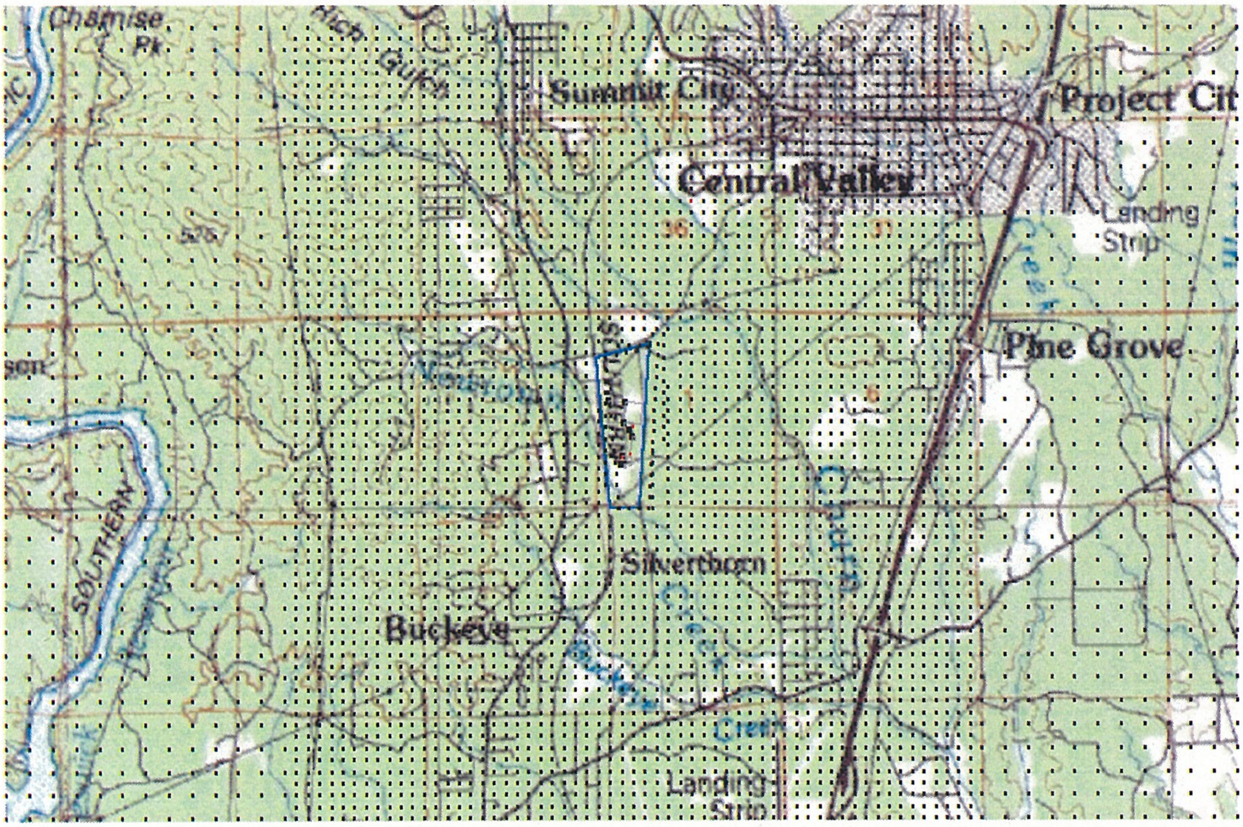

Figure 6.4-1. Modeled Receptor Grid Near Knauf Fiber Glass.

6.5 Rural/Urban Determination

A technique was developed by Irwin (1979) to classify a site area as either rural or urban for purposes of using rural or urban dispersion coefficients. The classification can be based on either land use or population density within 3 kilometers of an emission source. Of these, the USEPA has specified that land use is the most definitive criterion (USEPA, 1993b).

Using the meteorological land use typing scheme established by Auer (1978) for an area within a 3 kilometer radius from a site, an urban classification of the site area requires more than 50 percent of the following land use types: heavy industrial, light-moderate industrial, commercial, single family compact residential, and multi-family compact residential. Since rural land use types comprise greater than 70% of the total area in the vicinity of the Knauf facility, rural dispersion coefficients were employed in the model to calculate plume dispersion (see Figure 6.5-1).

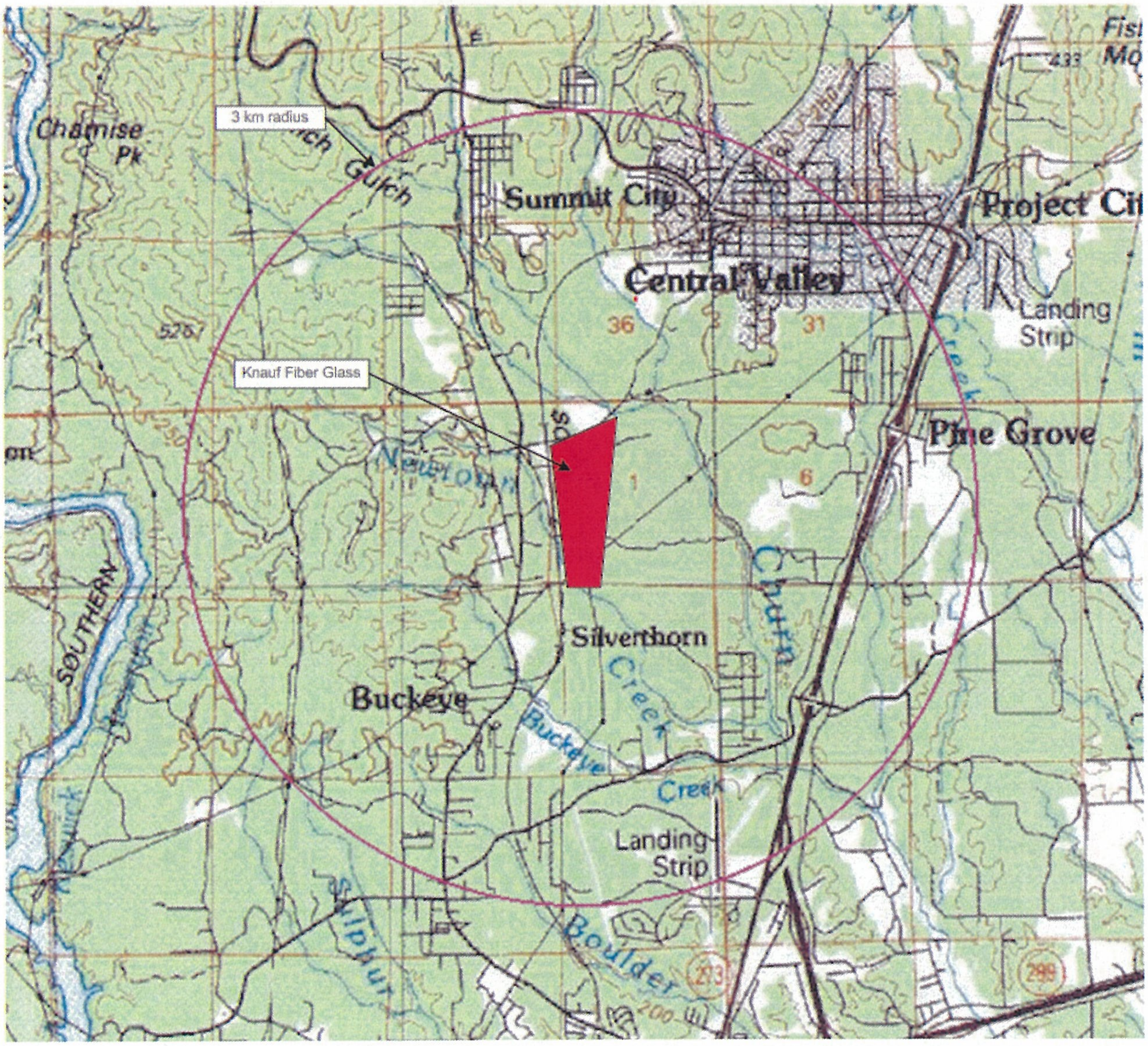

Figure 6.5-1. Topographical Map of Area Near the Knauf Fiber Glass Site.

6.6 Modeling Analysis

A modeling analysis was performed at 1 hour and annual intervals for NO_x, and 24 hour and annual intervals for PM_{10}. An analysis for SO_2, CO, Phenol, Formaldehyde, ROG and Ammonia was performed for the original PSD permit application submittal and will not be repeated here since the emissions of these pollutants remains unchanged. Table 6.6-1 presents a summary of the modeling results, with a complete listing in Appendix C. Also included in Appendix C is a CD-ROM containing all modeling input and output files. Concentration distribution isopleths for NO_x and PM_{10} can be found in Appendix D.

Table 6.6-1. Air Quality Modeling Results.

Pollutant	Averaging Period	Maximum Concentration – Original PSD Proposed Limits ($\mu g/m^3$)	Maximum Concentration - Revised Limits ($\mu g/m^3$)	PSD Increment ($\mu g/m^3$)	Significant Impact Levels ($\mu g/m^3$)
PM_{10}	24-Hour	11.3	6.7	30	5
	Annual	0.62	0.65	17	1
NO_x	1-Hour	14.3	71.6	NA	NA
	Annual	0.08	0.45	25	1

Since the maximum 24-hour PM_{10} concentration of 11.3 $\mu g/m^3$ was in excess of the 5.0 $\mu g/m^3$ significant impact level, modeling runs were also performed that included the contribution of PM_{10} emissions from the Sierra Pacific mill located 1.4 miles away. At the time of the original PSD permit application submittal Sierra Pacific was the only significant emission source in the vicinity of the proposed Knauf Fiber Glass plant identified by the Shasta County Air Pollution Control Officer and is the only additional significant emission source included in this analysis.

The Sierra Pacific PM_{10} emission rates provided by the Agency (Kussow, 1996) were 2.88 lb/hr for the fuel silo cyclone, 3.55 lb/hr for the planer-shaver silo cyclone, 5.0 lb/hr for boiler 1, and 3.5 lb/hr for boiler 2. These same emission rates and sources were used in this study to ensure consistency between the two permit applications (original vs. new). No additional sources were added since there has been a decrease in PM_{10} emissions, and this facility is no longer a PSD source.

6.6.1 Ambient Air Quality Analysis

The Knauf PM_{10} emissions were modeled along with the Sierra Pacific PM_{10} emission sources to demonstrate compliance with both the National Ambient Air Quality Standards (NAAQS) and the CARB ambient air quality standards. In addition, NO_x emission impacts are compared with National and CARB Ambient Air Quality Standards even though impacts were below the PSD significance level of 1 $\mu g/m^3$.

Table 6.6-2 summarizes the results of the analysis. The results indicate that the maximum PM_{10} and NO_x impacts from Knauf, when combined with the background ambient air quality and Sierra Pacific PM_{10} contributions at the point of maximum impact, will comply with the National and CARB Ambient Air Quality Standards. In addition, this analysis does not take into account offsets obtained by Knauf for the existing permit PM_{10} emission limit, and for the increase in NO_x requested in this permit application.

Table 6.6-2. Ambient Air Quality Impacts from Knauf.

Pollutant	Averaging Period	Modeled Maximum for Knauf ($\mu g/m^3$)	Maximum Background Ambient Air Quality[1,2,3,4] ($\mu g/m^3$)	Combined Total Impact ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	CARBAQS ($\mu g/m^3$)
PM_{10}	24-Hour	6.7	37.4	44.1	150	50
	Annual	0.65	13.7	14.5	50	30
NO_x	1-Hour	71.6	92.0	163.6	NA	500
	Annual	0.45	1.5	2.0	100	NA

1. PM_{10} ambient air quality data from City of Shasta Lake Animal Shelter monitoring station, data taken from 1/1/2001 to 2/14/2003
2. 24 hour PM_{10} background concentration listed is second high over monitoring period due to maximum being caused by forest fires in California and Oregon during the summer of 2002 (56.3 $\mu g/m^3$)
3. NO_x ambient air quality data from Bella Vista, CA Ozone Study performed by CARB in 2000
4. Value provided for annual NO_x background concentration is average value from 45 day sampling period

6.6.2 Increment Analysis

The PSD regulations establish the term "increment" which is the maximum allowable increase in concentration that is allowed to occur for a pollutant. The "baseline" concentration is defined for each pollutant and averaging time as the ambient concentration existing at the time that the first PSD permit application affecting the area is submitted. Significant deterioration is said to occur when the amount of new pollution would exceed the applicable PSD increment.

Several dates are important. The "major source baseline date" is the date after which actual emissions associated with the construction at the source affect the available PSD increment. Other changes in actual emissions occurring at any source after the major source baseline date do not affect the increment, but instead (until the minor source baseline date is established) contribute to the baseline concentration.

The "trigger date" is the date after which the minor source baseline date may be established. The "minor source baseline date" is the earliest date after the trigger date on which a complete PSD application is received and accepted by the permit-reviewing agency. This date marks the point in time after which all sources affect the available increment. The area in which the minor source baseline date is established the permit application is known as the "baseline area," which includes all portions of the attainment (or unclassifiable area) in which the PSD applicant proposes to locate and any attainment (or unclassifiable area) in which the proposed emissions would have a significant ambient impact (defined at > 1 $\mu g/m^3$ for an annual average).

On December 19, 1996, Knauf representatives met with Messrs. Michael Kussow and Ken Berryman of the Shasta County Air Pollution Control District to discuss the Air Permit Application. At the meeting, it was learned that (1) no other PSD project has located in the Shasta Lake "baseline area" for the Knauf site, (2) the only significant emission source near the Knauf facility was the Sierra Pacific mill, and (3) the full PSD increment was still available for the Knauf project. Therefore, the minor source baseline date was established on the date that the Knauf permit application was deemed complete by Shasta County.

This PSD increment analysis was performed to demonstrate that that facility's proposed PM_{10} reduction results in a decrease in the increment consumed within the "baseline area". This analysis is being performed despite Knauf's proposal to modify the PSD permit issued on March 22, 2000 to levels below the PSD threshold.

The key dates for this project applicable to PM_{10} are as follows:

- Major Source Baseline Date — January 6, 1975
- Trigger Date — August 7, 1977
- Minor Source Baseline Date — July 17, 1997

Since the Sierra Pacific facility air permit and emission rates were modified after the August 7, 1977 trigger date, those emissions were included in the determination of increment consumption. In the absence of the Sierra Pacific "actual' emission rates which should be used in the increment analysis, the air quality impact analysis and increment analysis was conservatively conducted with "permitted" emission rates, assuming 8760 hours/year of operation at 100% capacity.

Table 6.6-3 summarizes the PM_{10} increment consumption in conjunction with the Sierra Pacific. Based on the original PSD increment analysis, the Knauf project was predicted consume 44.0% of the available 24-hour increment, and 10.5% of the available annual increment. Table 6.6-4 shows the revised increment analysis which indicates that, if Knauf were to remain a PSD emission source, 24 hour and annual increment consumption would be reduced to 22.3% and 4.7%, respectively.

Table 6.6-3. Original PM_{10} Increment Analysis.

Averaging Period	Maximum Concentration ($\mu g/m^3$)	Contribution at Knauf Maximum from Sierra Pacific ($\mu g/m^3$)	Combined Total Impact ($\mu g/m^3$)	PSD Increment Available ($\mu g/m^3$)	Percent of Total Increment Consumed by Knauf Project
24-Hour	11.42	1.77	13.19	30	44.0%
Annual	0.57	1.22	1.79	17	10.5%

Table 6.6-4. Revised PM_{10} Increment Analysis.

Averaging Period	Maximum Concentration ($\mu g/m^3$)	Contribution at Knauf Maximum from Sierra Pacific ($\mu g/m^3$)	Combined Total Impact ($\mu g/m^3$)	PSD Increment Available ($\mu g/m^3$)	Percent of Total Increment Consumed by Knauf Project
24-Hour	6.7	0	6.7	30	22.3%
Annual	0.7	0.1	0.8	17	4.7%

For NO_x emissions, the PSD increment is 25 $\mu g/m^3$ with a 1$\mu g/m^3$ significant impact level. Since the maximum annual NO_x impact was only 0.45 $\mu g/m^3$, no increment analysis is required.

6.7 Emissions Offsets

6.7.1 Particulates

The Knauf facility has obtained PM_{10} emission offsets at a ratio of 1.2 to 1 for emissions above 25 TPY. This equates to 1.2*(124.4 - 25), or 119.3 TPY. The offsets are from road paving and purchasing of existing emission credits.

6.7.2. NO_x

The Knauf facility has obtained NO_x emission offsets at a ratio of 1.0 to 1 for NO_x emissions over 4.6 TPY, up to the proposed permit limit of 99 TPY. All such offset credits were certified through the Shasta County Air Quality Management District.

7.0 GOOD ENGINEERING PRACTICE STACK HEIGHT

A Good Engineering Practice (GEP) stack height determination was made for the proposed furnace/forming exhaust stack. GEP stacks reduce the effects of building downwash, a condition which can lead to increased air pollution concentrations at ground level. GEP stack heights are also used by EPA as an "upper limit" stack height for the purposes of modeling ground level pollutant concentrations from proposed sources.

Given the dimensions of the Knauf Shasta buildings, with a maximum building height of 78 feet, plus a batch house height of 125 feet, the GEP stack height to avoid downwash effects in all directions is 310.2 feet. The stack height of 199 feet has been kept lower than the GEP height to minimize the visual impact of the facility. By staying below 200 feet, no stack lighting was needed in accordance with Federal Aviation Administration (FAA) requirements.

Since non-GEP stack heights were evaluated, the ISCST3 model was run with the option to evaluate the effects of aerodynamic downwash. The direction specific downwash option of the model was used for the modeling studies.

8.0 HAZARDOUS AIR POLLUTANTS

8.1 Permissible Exposure Limits

The State of California has set 8-hour permissible exposure limits (PELs) for a number of Hazardous Air Pollutants (HAPs), including Ammonia, Formaldehyde and Phenol. The results of this evaluation from the original PSD application are repeated here for information only.

Ammonia emissions from the Knauf facility are a maximum of 38 lbs/hr. At this emission rate, the maximum-modeled ammonia concentration was 34.55 $\mu g/m^3$. Since the calculated ammonia concentration is significantly less than the 8-Hour PEL of 18,000 $\mu g/m^3$, no further modeling was required.

Formaldehyde emissions from the Knauf facility are a maximum of 2 lbs/hr. At this emission rate, the maximum-modeled formaldehyde concentration was 1.82 $\mu g/m^3$. Since the calculated concentration is significantly less than the 8-Hour PEL of 2,000 $\mu g/m^3$, no further modeling was required.

Phenol emissions from the Knauf facility are a maximum of 6 lbs/hr. At this emission rate, the maximum-modeled phenol concentration was 5.46 $\mu g/m^3$. Since the calculated concentration is significantly less than the 8-Hour PEL of 19,000 $\mu g/m^3$, no further modeling was required.

The modeling results for the Hazardous Air Pollutants emitted from the Knauf facility along with their 8-hour PEL limits are presented in Table 8.1-1.

Table 8.1-1. Hazardous Air Pollutant Concentrations 200' Stack.

Pollutant	Concentration ($\mu g/m^3$)	8-Hour PEL ($\mu g/m^3$)
Ammonia	34.55	18,000
Formaldehyde	1.82	2,000
Phenol	5.46	19,000

8.2 Hazard Risk Analysis

To assess the significance of the project's hazardous air pollutant emissions, dispersion modeling was conducted to predict the maximum 1-hour and 5-year average concentrations in the project vicinity. Incremental human health risks were calculated using health risk factors provided by the California Air Pollution Control Officers Association (CAPCOA), as discussed in Section 3.7.

A summary of the maximum predicted HAP concentrations from the original PSD permit is presented here for information only. This summary reflects levels that may occur during plant operation is given in Table 8.2-1. The results demonstrate that, in accordance with the CAPCOA health risk factors and assessment procedures, the Knauf Shasta HAP emissions are insignificant, and do not result in any adverse health effects.

8.2.1 Phenol

Based on the Air Toxics "Hot Spots" Program Risk Assessment Guidelines, there is no Unit Risk Factor for phenol. The chronic noncancer Reference Exposure Level (REL) is 45.0 $\mu g/m^3$, and there is no acute noncancer REL.

A hazard index greater than 1.0 indicates a potential for adverse health effects. The chronic hazard index for phenol is calculated by dividing the chemical's 5-year average concentration by the REL.

200' Stack

Phenol Chronic Hazard Index = 0.07 $\mu g/m^3$ / 45.0 $\mu g/m^3$ = **0.00156**

8.2.2 Formaldehyde

The cancer unit risk factor for formaldehyde is 6.0E-6 $(\mu g/m^3)^{-1}$. (Risks associated with different chemicals are additive.) To calculate the cancer risk, the 5-year average concentration predicted by modeling is multiplied by the unit risk factor.

200' Stack

Formaldehyde Risk Factor = 0.02 $\mu g/m^3$ * 6.0E-6 $(\mu g/m^3)^{-1}$ = **0.00000012**

The chronic noncancer REL is 3.6 $\mu g/m^3$, and the acute noncancer REL is 370 $\mu g/m^3$. The chronic hazard index for formaldehyde is calculated by dividing the chemical's 5-year average concentration by the REL. The acute hazard index for formaldehyde is calculated by dividing the chemical's maximum 1-hour average concentration by the REL.

200' Stack

Formaldehyde Chronic Hazard Index = 0.02 $\mu g/m^3$ / 3.6 $\mu g/m^3$ = **0.00556**

Formaldehyde Acute Hazard Index = 5.05 $\mu g/m^3$ / 370.0 $\mu g/m^3$ = **0.01365**

8.2.3 Ammonia

There is no cancer unit risk factor for ammonia. The chronic noncancer (REL) is 100.0 $\mu g/m^3$, and the acute noncancer REL is 2,100 $\mu g/m^3$. The chronic hazard index for ammonia is calculated by dividing the chemical's 5-year average concentration by the REL. The acute hazard index for ammonia is calculated by dividing the chemical's maximum 1-hour average concentration by the REL.

200' Stack

Ammonia Chronic Hazard Index = 0.44 $\mu g/m^3$ / 100.0 $\mu g/m^3$ = **0.0044**

Ammonia Acute Hazard Index = 96.00 $\mu g/m^3$ / 2,100.0 $\mu g/m^3$ = **0.04571**

Table 8.2-1. Summary of Hazardous Air Pollutant Impacts 200' Stack

Pollutant	5-Year Average (μg/m³)	Maximum 1-Hour (μg/m³)	Incremental Lifetime Cancer Risk	Chronic Hazard Index	Acute Hazard Index
Phenol	0.07	15.16	–	0.00156	–
Formaldehyde	0.02	5.05	0.00000012	0.00556	0.01365
Ammonia	0.44	96.00	–	0.0044	0.04571
Total			0.00000012		
Significance Criteria			0.00001	> 1.0	> 1.0

9.0 SOILS AND VEGETATION

With the plant in operation, air emissions from the facility will have no impact on soils and vegetation in the area. The Knauf facility combusts only natural gas which is extremely low in sulfur. Therefore, there are insignificant amounts of "acid rain" precursors commonly found in plumes from oil- and coal-fired emission sources.

The stack emissions from the facility will have no impact on soils and vegetation in the region. As demonstrated by the modeling study, the air quality impacts demonstrate full compliance with the NAAQS levels for all pollutants. The NAAQS levels were established to protect human health and public welfare (including soils and vegetation). By demonstrating that the Knauf facility will not cause violations of the NAAQS, one may conclude that there will be no impact on soils and vegetation.

10.0 CLASS I AREA IMPACT ANALYSIS AND VISIBILITY

PSD regulations require estimation of the impact of criteria pollutants and visibility impairment on any Class I area within 200 kilometers (100 miles) of a major source. This study is in preparation and will be submitted under separate cover. Long range modeling will be completed with the EPA CALPUFF model. Pollutant concentrations at Class I areas will be compared to EPA standards and Federal Land Manager accepted guidelines.

A Level II Visibility Impairment study was performed using the EPA VISCREEN Model for the original PSD permit application. The new guidelines require the use of EPA's CALPUFF model for visibility, as well. Although the Knauf facility is no longer a PSD source, this study is being completed and will be submitted along with the Class I impact analysis.

11.0 REFERENCES

1. Air & Waste Management Association, *New Source Review: Prevention of Significant Deterioration and Nonattainment Area Guidance Notebook*, Pittsburgh, 1996.

2. Auer, A. H., "Correlation of Land Use and Cover with Meteorological Anomalies," *Journal of Applied Meteorology,* 17:636-643, 1978.

3. Kussow, R. M., Personal communication with Shasta County, Department of Resource Management, Air Quality Management District, Air Pollution Control Officer, December, 1996.

4. Shasta County, Department of Resource Management, Air Quality Management District, *Air Quality Management District, Rules and Regulations*, Redding, California.

5. Trinity Consultants, *Practical Guide to Dispersion Modeling*, Dallas, 1992.

6. U.S. Environmental Protection Agency, *Guideline for Determination of Good Engineering Practice Stack Height* (*Technical support Document for the Stack Height Regulations*), Research Triangle Park, North Carolina, July, 1981, EPA-450/4-80-023.

7. U.S. Environmental Protection Agency, *New Source Review Workshop Manual, Prevention of Significant Deterioration and Nonattainment Area Permitting*, Research Triangle Park, North Carolina, 1990.

Appendix A

Emission Summary

Electric Furnace Baghouse Emissions

	Electric Furnace Baghouse Stack
Exhaust Flow (lbs/hour):	98,825
Glass Pull Rate (tons/day)	195
Inlet Particulate Loading (lb/hr)	250.0
Removal Efficiency (%)	99.8
Unmargined Outlet Particulate Loading (lb/hr)	0.5
Exhaust Moisture (%)	3.1
Exhaust Molecular Wt.	28.9
Exhaust Temperature (F)	115.3
Bar. Pressure (PSIA)	14.390
ACFM	24,426
DSCFM (60 F; 14.696 PSIA; 0% H2O)	20,948
SCFM	21,618
Stack Exit Diameter (ft)	1.74
Stack Exit Velocity (ft/min)	10,286
Stack Exit Velocity (ft/sec)	171.4
Particulates (lb/hr), with margin	**1.0**
Particulates (lb/ton of glass pulled), with margin	0.12
MACT Standard (lb/ton)	0.50

Manufacturing Line Forming/Oven/Cooling Stack Emissions

	Individual Sources			
	Forming	Oven/Cooling	Oxidizer	Combined Stack
Exhaust Flow (lbs/hour)	1,427,677	144,619		1,572,296
Glass Pull Rate (tons/day)	195			195
Total Heat Input (million Btu/hr)	55	29.6	36	120.6
NOx emission rate (lb/million Btu)	0.0525	0.034	0.08	0.056
Natural Gas (10^6 scf)	0.053	0.029	0.035	
Particulates after ESP(lb/hr), Method 5E				**21.6**
NOx from combustion (lb/hr)	2.888	1.01	2.88	6.77
NOx from NH3 to NOx Conversion (lb/hr)		1.58	14.24	15.83
Total NOx (lb/hr)				**22.6**
Exhaust Moisture (%)	6	6		6.0
Exhaust Molecular Wt.	28.9	28.9		28.9
Exhaust Temperature (F)	101	500		137.7
Bar. Pressure (PSIA)	14.39	14.39		14.390
ACFM	344,373	59,697		404,070
DSCFM (60 F; 14.696 PSIA; 0% H2O)	293,818	29,763		323,581
SCFM	312,573	31,663		344,235
Stack Exit Diameter (ft)				17
Stack Exit Velocity (ft/min)				1780.2
Stack Exit Velocity (ft/sec)				29.67

Appendix B

Meteorological Data Summary

Summary of Meteorological Data
For Year 1987

Percentage Occurrence of Stability Classes

A	B	C	D	E	F
1.1	9.2	12.9	36.2	12.7	27.9

Distribution of Wind Direction vs. Stability (Hours)

	Stability Class						
Dir	A	B	C	D	E	F	Totals
N	2.	76.	143.	521.	185.	492.	1419.
NNE	2.	19.	33.	108.	20.	110.	292.
NE	2.	14.	18.	47.	19.	77.	177.
ENE	3.	23.	27.	41.	17.	55.	166.
E	6.	29.	29.	61.	15.	50.	190.
ESE	4.	24.	24.	50.	12.	32.	146.
SE	6.	54.	52.	84.	44.	53.	293.
SSE	3.	70.	122.	224.	66.	53.	538.
S	16.	156.	236.	738.	109.	64.	1319.
SSW	13.	68.	59.	149.	26.	21.	336.
SW	10.	48.	47.	76.	26.	22.	229.
WSW	3.	42.	26.	65.	26.	42.	204.
W	4.	36.	36.	103.	46.	54.	279.
WNW	7.	26.	28.	107.	88.	90.	346.
NW	7.	45.	64.	172.	163.	253.	704.
NNW	1.	58.	136.	468.	252.	393.	1308.
Calm	11.	18.	50.	153.	0.	582.	814.
Totals	100.	806.	1130.	3167.	1114.	2443.	8760.

Summary of Meteorological Data
For Year 1988

Percentage Occurrence of Stability Classes

A	B	C	D	E	F
1.6	8.7	12.8	36.8	12.2	28.0

Distribution of Wind Direction vs. Stability (Hours)

	Stability Class						
Dir	A	B	C	D	E	F	Totals
N	8.	74.	157.	609.	129.	455.	1432.
NNE	3.	17.	14.	94.	19.	91.	238.
NE	5.	20.	18.	44.	16.	62.	165.
ENE	1.	16.	15.	53.	17.	48.	150.
E	8.	37.	24.	62.	17.	44.	192.
ESE	6.	30.	30.	39.	18.	24.	147.
SE	6.	46.	73.	70.	42.	33.	270.
SSE	3.	60.	96.	203.	64.	40.	466.
S	23.	136.	206.	619.	85.	55.	1124.
SSW	13.	51.	50.	144.	27.	32.	317.
SW	10.	48.	28.	85.	25.	24.	220.
WSW	5.	33.	22.	67.	17.	31.	175.
W	7.	42.	34.	101.	50.	51.	285.
WNW	5.	36.	32.	136.	88.	97.	394.
NW	9.	41.	72.	181.	193.	243.	739.
NNW	6.	47.	170.	565.	263.	399.	1450.
Calm	19.	33.	80.	160.	0.	728.	1020.
Totals	137.	767.	1121.	3232.	1070.	2457.	8784.

Summary of Meteorological Data
For Year 1989

Percentage Occurrence of Stability Classes

A	B	C	D	E	F
1.2	9.4	13.0	34.2	12.3	29.9

Distribution of Wind Direction vs. Stability (Hours)

	Stability Class						
Dir	A	B	C	D	E	F	Totals
N	6.	68.	166.	690.	203.	526.	1659.
NNE	1.	25.	36.	77.	31.	135.	305.
NE	2.	17.	27.	36.	22.	85.	189.
ENE	2.	16.	17.	50.	7.	43.	135.
E	8.	27.	26.	44.	17.	36.	158.
ESE	4.	23.	27.	57.	16.	40.	167.
SE	5.	67.	72.	81.	38.	46.	309.
SSE	5.	54.	91.	183.	47.	46.	426.
S	8.	138.	202.	580.	88.	45.	1061.
SSW	2.	52.	61.	137.	38.	13.	303.
SW	7.	47.	41.	96.	17.	24.	232.
WSW	4.	35.	28.	66.	21.	21.	175.
W	11.	37.	37.	84.	32.	56.	257.
WNW	6.	31.	31.	83.	49.	61.	261.
NW	8.	55.	61.	146.	161.	181.	612.
NNW	8.	49.	124.	370.	287.	416.	1254.
Calm	20.	85.	92.	213.	0.	847.	1257.
Totals	107.	826.	1139.	2993.	1074.	2621.	8760.

Summary of Meteorological Data
For Year 1990

Percentage Occurrence of Stability Classes

A	B	C	D	E	F
1.9	8.9	13.6	31.2	12.9	31.5

Distribution of Wind Direction vs. Stability (Hours)

	Stability Class						
Dir	A	B	C	D	E	F	Totals
N	8.	49.	178.	544.	247.	470.	1496.
NNE	2.	28.	36.	82.	23.	127.	298.
NE	2.	22.	32.	44.	14.	72.	186.
ENE	8.	31.	24.	39.	14.	48.	164.
E	4.	31.	27.	32.	12.	45.	151.
ESE	5.	27.	25.	38.	18.	18.	131.
SE	5.	36.	47.	71.	17.	27.	203.
SSE	7.	33.	110.	161.	48.	29.	388.
S	15.	119.	210.	558.	95.	35.	1032.
SSW	4.	61.	65.	143.	26.	15.	314.
SW	5.	53.	39.	86.	24.	19.	226.
WSW	7.	41.	26.	53.	23.	24.	174.
W	6.	31.	27.	73.	33.	47.	217.
WNW	6.	33.	29.	67.	68.	64.	267.
NW	7.	48.	52.	132.	152.	231.	622.
NNW	8.	44.	129.	370.	316.	408.	1275.
Calm	64.	91.	136.	242.	0.	1083.	1616.
Totals	163.	778.	1192.	2735.	1130.	2762.	8760.

Summary of Meteorological Data
For Year 1991

Percentage Occurrence of Stability Classes

A	B	C	D	E	F
1.1	9.4	13.7	32.9	11.9	31.1

Distribution of Wind Direction vs. Stability (Hours)

Dir	Stability Class A	B	C	D	E	F	Totals
N	4.	75.	174.	631.	224.	466.	1574.
NNE	1.	28.	32.	80.	27.	129.	297.
NE	2.	16.	27.	59.	22.	82.	208.
ENE	1.	19.	17.	32.	20.	57.	146.
E	4.	42.	35.	65.	13.	50.	209.
ESE	3.	29.	31.	45.	17.	29.	154.
SE	4.	38.	53.	79.	32.	31.	237.
SSE	3.	54.	100.	197.	68.	47.	469.
S	15.	150.	217.	564.	98.	50.	1094.
SSW	6.	55.	73.	131.	32.	26.	323.
SW	4.	50.	46.	74.	24.	24.	222.
WSW	5.	35.	29.	62.	17.	23.	171.
W	4.	30.	40.	90.	40.	56.	260.
WNW	2.	26.	28.	90.	53.	80.	279.
NW	6.	39.	61.	124.	130.	210.	570.
NNW	5.	36.	102.	261.	227.	354.	985.
Calm	28.	103.	131.	294.	0.	1006.	1562.
Totals	97.	825.	1196.	2878.	1044.	2720.	8760.

```
*** ISC3P - VERSION 01228 ***
*** Knauf Shasta Lake                                                  ***
*** Model Executed on 05/19/03 at 18:18:36 ***
 Input File - d:\modeling\Knauf - Shasta Lake\Modeling\1hr NOx 87-91.DTA

Output File - d:\modeling\Knauf - Shasta Lake\Modeling\1hr NOx 87-91.LST

   Met File - D:\modeling\Knauf - Shasta Lake\Modeling\Met Data\red87_91.asc

      Number of sources -          2
Number of source groups -          4
    Number of receptors -       8103
```

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
FORM_1	0	0.71316E+00	551570.2	4500723.5	225.0	60.66	360.93	10.03	5.18	YES	
FORM_2	0	0.28476E+01	551570.2	4500723.5	225.0	60.66	331.87	9.04	5.18	YES	

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
KF_ORIG	FORM_1 ,
KF_REV	FORM_2 ,
ALL_ORIG	FORM_1 ,
ALL_REV	FORM_2 ,

*** THE SUMMARY OF HIGHEST 1-HR RESULTS ***

** CONC OF NOX IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC	DATE (YYMMDDHH)	RECEPTOR (XR, YR, ZELEV, ZFLAG)				OF TYPE	NETWORK GRID-ID
KF_ORIG	HIGH 1ST HIGH VALUE IS	14.25712	ON 87092420: AT (	550400.00,	4500700.00,	376.10,	0.00)	DC	NA
	HIGH 2ND HIGH VALUE IS	13.99927	ON 88030302: AT (	550400.00,	4500700.00,	376.10,	0.00)	DC	NA
KF_REV	HIGH 1ST HIGH VALUE IS	71.59155	ON 87092420: AT (	550500.00,	4500700.00,	355.40,	0.00)	DC	NA
	HIGH 2ND HIGH VALUE IS	68.52325	ON 88030302: AT (	550500.00,	4500700.00,	355.40,	0.00)	DC	NA
ALL_ORIG	HIGH 1ST HIGH VALUE IS	14.25712	ON 87092420: AT (	550400.00,	4500700.00,	376.10,	0.00)	DC	NA
	HIGH 2ND HIGH VALUE IS	13.99927	ON 88030302: AT (	550400.00,	4500700.00,	376.10,	0.00)	DC	NA
ALL_REV	HIGH 1ST HIGH VALUE IS	71.59155	ON 87092420: AT (	550500.00,	4500700.00,	355.40,	0.00)	DC	NA
	HIGH 2ND HIGH VALUE IS	68.52325	ON 88030302: AT (	550500.00,	4500700.00,	355.40,	0.00)	DC	NA

*** ISC3P - VERSION 01228 ***
*** Knauf Shasta Lake ***
*** Model Executed on 05/19/03 at 18:26:15 ***
Input File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual NOx 87.DTA

Output File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual NOx 87.LST

Met File - D:\modeling\Knauf - Shasta Lake\Modeling\Met Data\redc87.asc

Number of sources - 2
Number of source groups - 4
Number of receptors - 8103

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
FORM_1	0	0.71316E+00	551570.2	4500723.5	225.0	60.66	360.93	10.03	5.18	YES	
FORM_2	0	0.28476E+01	551570.2	4500723.5	225.0	60.66	331.87	9.04	5.18	YES	

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
KF_ORIG	FORM_1 ,
KF_REV	FORM_2 ,
ALL_ORIG	FORM_1 ,
ALL_REV	FORM_2 ,

*** THE SUMMARY OF MAXIMUM ANNUAL (8760 HRS) RESULTS ***

** CONC OF NOX IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZFLAG)				OF TYPE	NETWORK GRID-ID
KF_ORIG	1ST HIGHEST VALUE IS	0.08074 AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.08000 AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.07844 AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.07641 AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.07633 AT (	551400.00,	4503700.00,	293.00,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.07578 AT (	551300.00,	4504000.00,	314.60,	0.00)	DC	NA
KF_REV	1ST HIGHEST VALUE IS	0.45047 AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.44966 AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.44569 AT (	551400.00,	4503700.00,	293.00,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.44258 AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.42998 AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.42285 AT (	551300.00,	4503700.00,	291.70,	0.00)	DC	NA
ALL_ORIG	1ST HIGHEST VALUE IS	0.08074 AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.08000 AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.07844 AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.07641 AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.07633 AT (	551400.00,	4503700.00,	293.00,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.07578 AT (	551300.00,	4504000.00,	314.60,	0.00)	DC	NA
ALL_REV	1ST HIGHEST VALUE IS	0.45047 AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.44966 AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.44569 AT (	551400.00,	4503700.00,	293.00,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.44258 AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.42998 AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.42285 AT (	551300.00,	4503700.00,	291.70,	0.00)	DC	NA

```
*** ISC3P - VERSION 01228 ***
 *** Knauf Shasta Lake                                                        ***
 *** Model Executed on 05/19/03 at 18:27:46 ***
  Input File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual NOx 88.DTA

 Output File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual NOx 88.LST

    Met File - D:\modeling\Knauf - Shasta Lake\Modeling\Met Data\redc88.asc

       Number of sources -           2
 Number of source groups -           4
     Number of receptors -        8103
```

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
FORM_1	0	0.71316E+00	551570.2	4500723.5	225.0	60.66	360.93	10.03	5.18	YES	
FORM_2	0	0.28476E+01	551570.2	4500723.5	225.0	60.66	331.87	9.04	5.18	YES	

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
KF_ORIG	FORM_1 ,
KF_REV	FORM_2 ,
ALL_ORIG	FORM_1 ,
ALL_REV	FORM_2 ,

*** THE SUMMARY OF MAXIMUM ANNUAL (8784 HRS) RESULTS ***

** CONC OF NOX IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZFLAG)				OF TYPE	NETWORK GRID-ID
KF_ORIG	1ST HIGHEST VALUE IS	0.06613 AT (	550400.00,	4500600.00,	361.00,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.06471 AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.06388 AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.06355 AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.06221 AT (	551500.00,	4504100.00,	309.70,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.06219 AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
KF_REV	1ST HIGHEST VALUE IS	0.37098 AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.36470 AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.36366 AT (	551400.00,	4503700.00,	293.00,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.35994 AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.35561 AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.34986 AT (	551500.00,	4504100.00,	309.70,	0.00)	DC	NA
ALL_ORIG	1ST HIGHEST VALUE IS	0.06613 AT (	550400.00,	4500600.00,	361.00,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.06471 AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.06388 AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.06355 AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.06221 AT (	551500.00,	4504100.00,	309.70,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.06219 AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
ALL_REV	1ST HIGHEST VALUE IS	0.37098 AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.36470 AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.36366 AT (	551400.00,	4503700.00,	293.00,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.35994 AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.35561 AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.34986 AT (	551500.00,	4504100.00,	309.70,	0.00)	DC	NA

```
*** ISC3P - VERSION 01228 ***
 *** Knauf Shasta Lake                                                    ***
 *** Model Executed on 05/19/03 at 18:29:12 ***
  Input File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual NOx 89.DTA

 Output File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual NOx 89.LST

    Met File - D:\modeling\Knauf - Shasta Lake\Modeling\Met Data\redc89.asc

       Number of sources -          2
 Number of source groups -          4
     Number of receptors -       8103
```

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
FORM_1	0	0.71316E+00	551570.2	4500723.5	225.0	60.66	360.93	10.03	5.18	YES	
FORM_2	0	0.28476E+01	551570.2	4500723.5	225.0	60.66	331.87	9.04	5.18	YES	

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
KF_ORIG	FORM_1 ,
KF_REV	FORM_2 ,
ALL_ORIG	FORM_1 ,
ALL_REV	FORM_2 ,

*** THE SUMMARY OF MAXIMUM ANNUAL (8760 HRS) RESULTS ***

** CONC OF NOX IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC		RECEPTOR (XR, YR, ZELEV, ZFLAG)				OF TYPE	NETWORK GRID-ID
KF_ORIG	1ST HIGHEST VALUE IS	0.06518	AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.06467	AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.06448	AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.06296	AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.06279	AT (	551400.00,	4503700.00,	293.00,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.06259	AT (	551500.00,	4504100.00,	309.70,	0.00)	DC	NA
KF_REV	1ST HIGHEST VALUE IS	0.36823	AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.36210	AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.36180	AT (	551400.00,	4503700.00,	293.00,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.35684	AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.35171	AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.34784	AT (	551500.00,	4504000.00,	300.70,	0.00)	DC	NA
ALL_ORIG	1ST HIGHEST VALUE IS	0.06518	AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.06467	AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.06448	AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.06296	AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.06279	AT (	551400.00,	4503700.00,	293.00,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.06259	AT (	551500.00,	4504100.00,	309.70,	0.00)	DC	NA
ALL_REV	1ST HIGHEST VALUE IS	0.36823	AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.36210	AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.36180	AT (	551400.00,	4503700.00,	293.00,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.35684	AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.35171	AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.34784	AT (	551500.00,	4504000.00,	300.70,	0.00)	DC	NA

```
*** ISC3P - VERSION 01228 ***
 *** Knauf Shasta Lake                                                  ***
 *** Model Executed on 05/19/03 at 18:30:36 ***
  Input File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual NOx 90.DTA

 Output File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual NOx 90.LST

    Met File - D:\modeling\Knauf - Shasta Lake\Modeling\Met Data\redc90.asc

       Number of sources -          2
 Number of source groups -          4
     Number of receptors -       8103
```

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
FORM_1	0	0.71316E+00	551570.2	4500723.5	225.0	60.66	360.93	10.03	5.18	YES	
FORM_2	0	0.28476E+01	551570.2	4500723.5	225.0	60.66	331.87	9.04	5.18	YES	

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
KF_ORIG	FORM_1 ,
KF_REV	FORM_2 ,
ALL_ORIG	FORM_1 ,
ALL_REV	FORM_2 ,

*** THE SUMMARY OF MAXIMUM ANNUAL (8760 HRS) RESULTS ***

** CONC OF NOX   IN MICROGRAMS/M**3   **

GROUP ID		AVERAGE CONC		RECEPTOR (XR, YR, ZELEV, ZFLAG)				OF TYPE	NETWORK GRID-ID
KF_ORIG	1ST HIGHEST VALUE IS	0.06316	AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.06277	AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.06258	AT (	550500.00,	4500700.00,	355.40,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.06225	AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.06179	AT (	551500.00,	4504100.00,	309.70,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.06153	AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
KF_REV	1ST HIGHEST VALUE IS	0.37157	AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.36374	AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.36109	AT (	551400.00,	4503700.00,	293.00,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.36010	AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.35616	AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.35104	AT (	551500.00,	4504000.00,	300.70,	0.00)	DC	NA
ALL_ORIG	1ST HIGHEST VALUE IS	0.06316	AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.06277	AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.06258	AT (	550500.00,	4500700.00,	355.40,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.06225	AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.06179	AT (	551500.00,	4504100.00,	309.70,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.06153	AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
ALL_REV	1ST HIGHEST VALUE IS	0.37157	AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.36374	AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.36109	AT (	551400.00,	4503700.00,	293.00,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.36010	AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.35616	AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.35104	AT (	551500.00,	4504000.00,	300.70,	0.00)	DC	NA

*** ISC3P - VERSION 01228 ***
*** Knauf Shasta Lake ***
*** Model Executed on 05/19/03 at 18:31:55 ***
Input File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual NOx 91.DTA

Output File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual NOx 91.LST

Met File - D:\modeling\Knauf - Shasta Lake\Modeling\Met Data\redc91.asc

Number of sources - 2
Number of source groups - 4
Number of receptors - 8103

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
FORM_1	0	0.71316E+00	551570.2	4500723.5	225.0	60.66	360.93	10.03	5.18	YES	
FORM_2	0	0.28476E+01	551570.2	4500723.5	225.0	60.66	331.87	9.04	5.18	YES	

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
KF_ORIG	FORM_1 ,
KF_REV	FORM_2 ,
ALL_ORIG	FORM_1 ,
ALL_REV	FORM_2 ,

*** THE SUMMARY OF MAXIMUM ANNUAL (8760 HRS) RESULTS ***

** CONC OF NOX IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	NETWORK GRID-ID
KF_ORIG	1ST HIGHEST VALUE IS	0.07124	AT (551300.00, 4503900.00, 317.30, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.07063	AT (551300.00, 4503800.00, 311.70, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.06785	AT (551400.00, 4503800.00, 302.70, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.06631	AT (551300.00, 4504000.00, 314.60, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.06582	AT (551400.00, 4504000.00, 307.00, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.06550	AT (551400.00, 4503700.00, 293.00, 0.00)	DC	NA
KF_REV	1ST HIGHEST VALUE IS	0.39882	AT (551300.00, 4503800.00, 311.70, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.39147	AT (551300.00, 4503900.00, 317.30, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.38729	AT (551400.00, 4503800.00, 302.70, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.38016	AT (551400.00, 4503700.00, 293.00, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.37513	AT (551300.00, 4503700.00, 291.70, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.36896	AT (551400.00, 4504000.00, 307.00, 0.00)	DC	NA
ALL_ORIG	1ST HIGHEST VALUE IS	0.07124	AT (551300.00, 4503900.00, 317.30, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.07063	AT (551300.00, 4503800.00, 311.70, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.06785	AT (551400.00, 4503800.00, 302.70, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.06631	AT (551300.00, 4504000.00, 314.60, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.06582	AT (551400.00, 4504000.00, 307.00, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.06550	AT (551400.00, 4503700.00, 293.00, 0.00)	DC	NA
ALL_REV	1ST HIGHEST VALUE IS	0.39882	AT (551300.00, 4503800.00, 311.70, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.39147	AT (551300.00, 4503900.00, 317.30, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.38729	AT (551400.00, 4503800.00, 302.70, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.38016	AT (551400.00, 4503700.00, 293.00, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.37513	AT (551300.00, 4503700.00, 291.70, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.36896	AT (551400.00, 4504000.00, 307.00, 0.00)	DC	NA

*** ISC3P - VERSION 01228 ***
*** Knauf Shasta Lake ***
*** Model Executed on 05/19/03 at 18:33:16 ***
Input File - d:\modeling\Knauf - Shasta Lake\Modeling\24hr PM 87-91.DTA

Output File - d:\modeling\Knauf - Shasta Lake\Modeling\24hr PM 87-91.LST

Met File - D:\modeling\Knauf - Shasta Lake\Modeling\Met Data\red87_91.asc

Number of sources - 8
Number of source groups - 4
Number of receptors - 8103

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
FORM_1	0	0.54936E+01	551570.2	4500723.5	225.0	60.66	360.93	10.03	5.18	YES	
FURN_1	0	0.12600E-01	551581.7	4500632.5	224.0	25.91	352.59	21.12	0.53	YES	
FORM_2	0	0.27216E+01	551570.2	4500723.5	225.0	60.66	331.87	9.04	5.18	YES	
FURN_2	0	0.12600E+00	551581.7	4500632.5	224.0	25.91	319.43	16.67	0.94	YES	
FUELSILO	0	0.36288E+00	552100.0	4502900.0	243.5	13.11	291.48	7.37	1.52	NO	
PLANER	0	0.44730E+00	552100.0	4502900.0	243.5	18.29	291.48	9.08	1.52	NO	
BOILER1	0	0.63000E+00	552100.0	4502900.0	243.5	14.94	552.59	20.27	0.91	NO	
BOILER2	0	0.44100E+00	552100.0	4502900.0	243.5	12.19	433.15	12.70	1.07	NO	

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
KF_ORIG	FORM_1 , FURN_1 ,
KF_REV	FORM_2 , FURN_2 ,
ALL_ORIG	FORM_1 , FURN_1 , FUELSILO, PLANER , BOILER1 , BOILER2 ,
ALL_REV	FORM_2 , FURN_2 , FUELSILO, PLANER , BOILER1 , BOILER2 ,

*** THE SUMMARY OF HIGHEST 24-HR RESULTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC	DATE (YYMMDDHH)	RECEPTOR (XR, YR, ZELEV, ZFLAG)				OF TYPE	NETWORK GRID-ID
KF_ORIG	HIGH 1ST HIGH VALUE IS	11.26792c	ON 87070224: AT (	550400.00,	4500600.00,	361.00,	0.00)	DC	NA
	HIGH 2ND HIGH VALUE IS	9.58368	ON 88032124: AT (	550500.00,	4500700.00,	355.40,	0.00)	DC	NA
	HIGH 6TH HIGH VALUE IS	7.72136c	ON 89110924: AT (	550400.00,	4500600.00,	361.00,	0.00)	DC	NA
KF_REV	HIGH 1ST HIGH VALUE IS	6.71101c	ON 87070224: AT (	550500.00,	4500600.00,	335.00,	0.00)	DC	NA
	HIGH 2ND HIGH VALUE IS	5.54043	ON 88032124: AT (	550500.00,	4500700.00,	355.40,	0.00)	DC	NA
	HIGH 6TH HIGH VALUE IS	4.75082c	ON 89012124: AT (	550500.00,	4500700.00,	355.40,	0.00)	DC	NA
ALL_ORIG	HIGH 1ST HIGH VALUE IS	58.57283	ON 87120124: AT (	552200.00,	4503100.00,	257.50,	0.00)	DC	NA
	HIGH 2ND HIGH VALUE IS	44.18699c	ON 89062724: AT (	552200.00,	4503100.00,	257.50,	0.00)	DC	NA
	HIGH 6TH HIGH VALUE IS	34.10584c	ON 88070324: AT (	552200.00,	4503100.00,	257.50,	0.00)	DC	NA
ALL_REV	HIGH 1ST HIGH VALUE IS	58.42115	ON 87120124: AT (	552200.00,	4503100.00,	257.50,	0.00)	DC	NA
	HIGH 2ND HIGH VALUE IS	44.19031c	ON 89062724: AT (	552200.00,	4503100.00,	257.50,	0.00)	DC	NA
	HIGH 6TH HIGH VALUE IS	34.01730c	ON 90010924: AT (	552200.00,	4503100.00,	257.50,	0.00)	DC	NA

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*** ISC3P - VERSION 01228 ***
 *** Knauf Shasta Lake                                                              ***
 *** Model Executed on 05/19/03 at 19:04:16 ***
  Input File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual PM 87.DTA

 Output File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual PM 87.LST

    Met File - D:\modeling\Knauf - Shasta Lake\Modeling\Met Data\redc87.asc

       Number of sources -          8
 Number of source groups -          4
     Number of receptors -       8103
```

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
FORM_1	0	0.54936E+01	551570.2	4500723.5	225.0	60.66	360.93	10.03	5.18	YES	
FURN_1	0	0.12600E-01	551581.7	4500632.5	224.0	25.91	352.59	21.12	0.53	YES	
FORM_2	0	0.27216E+01	551570.2	4500723.5	225.0	60.66	331.87	9.04	5.18	YES	
FURN_2	0	0.12600E+00	551581.7	4500632.5	224.0	25.91	319.43	16.67	0.94	YES	
FUELSILO	0	0.36288E+00	552100.0	4502900.0	243.5	13.11	291.48	7.37	1.52	NO	
PLANER	0	0.44730E+00	552100.0	4502900.0	243.5	18.29	291.48	9.08	1.52	NO	
BOILER1	0	0.63000E+00	552100.0	4502900.0	243.5	14.94	552.59	20.27	0.91	NO	
BOILER2	0	0.44100E+00	552100.0	4502900.0	243.5	12.19	433.15	12.70	1.07	NO	

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
KF_ORIG	FORM_1 , FURN_1 ,
KF_REV	FORM_2 , FURN_2 ,
ALL_ORIG	FORM_1 , FURN_1 , FUELSILO, PLANER , BOILER1 , BOILER2 ,
ALL_REV	FORM_2 , FURN_2 , FUELSILO, PLANER , BOILER1 , BOILER2 ,

*** THE SUMMARY OF MAXIMUM ANNUAL (8760 HRS) RESULTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	NETWORK GRID-ID
KF_ORIG	1ST HIGHEST VALUE IS	0.62471 AT	(551300.00, 4503900.00, 317.30, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.61912 AT	(551300.00, 4503800.00, 311.70, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.60702 AT	(551400.00, 4503800.00, 302.70, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.59118 AT	(551400.00, 4504000.00, 307.00, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.59092 AT	(551400.00, 4503700.00, 293.00, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.58640 AT	(551300.00, 4504000.00, 314.60, 0.00)	DC	NA
KF_REV	1ST HIGHEST VALUE IS	0.56902 AT	(551689.00, 4500254.50, 224.40, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.56573 AT	(551737.00, 4500352.00, 223.50, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.56113 AT	(551734.00, 4500303.00, 225.40, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.54472 AT	(551740.00, 4500401.00, 221.30, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.52752 AT	(551647.00, 4500254.50, 221.20, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.51374 AT	(551731.00, 4500254.00, 223.90, 0.00)	DC	NA
ALL_ORIG	1ST HIGHEST VALUE IS	5.98166 AT	(552000.00, 4503300.00, 256.90, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	5.59200 AT	(552100.00, 4503300.00, 251.00, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	5.14775 AT	(552100.00, 4503400.00, 253.10, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	4.95639 AT	(552200.00, 4503300.00, 262.30, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	4.90113 AT	(552200.00, 4503200.00, 269.10, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	4.48876 AT	(552100.00, 4503500.00, 254.40, 0.00)	DC	NA
ALL_REV	1ST HIGHEST VALUE IS	5.96785 AT	(552000.00, 4503300.00, 256.90, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	5.58180 AT	(552100.00, 4503300.00, 251.00, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	5.13426 AT	(552100.00, 4503400.00, 253.10, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	4.94133 AT	(552200.00, 4503300.00, 262.30, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	4.88151 AT	(552200.00, 4503200.00, 269.10, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	4.47418 AT	(552100.00, 4503500.00, 254.40, 0.00)	DC	NA

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*** ISC3P - VERSION 01228 ***
 *** Knauf Shasta Lake                                                        ***
 *** Model Executed on 05/19/03 at 19:10:49 ***
  Input File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual PM 88.DTA

 Output File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual PM 88.LST

    Met File - D:\modeling\Knauf - Shasta Lake\Modeling\Met Data\redc88.asc

       Number of sources -          8
 Number of source groups -          4
     Number of receptors -       8103
```

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
FORM_1	0	0.54936E+01	551570.2	4500723.5	225.0	60.66	360.93	10.03	5.18	YES	
FURN_1	0	0.12600E-01	551581.7	4500632.5	224.0	25.91	352.59	21.12	0.53	YES	
FORM_2	0	0.27216E+01	551570.2	4500723.5	225.0	60.66	331.87	9.04	5.18	YES	
FURN_2	0	0.12600E+00	551581.7	4500632.5	224.0	25.91	319.43	16.67	0.94	YES	
FUELSILO	0	0.36288E+00	552100.0	4502900.0	243.5	13.11	291.48	7.37	1.52	NO	
PLANER	0	0.44730E+00	552100.0	4502900.0	243.5	18.29	291.48	9.08	1.52	NO	
BOILER1	0	0.63000E+00	552100.0	4502900.0	243.5	14.94	552.59	20.27	0.91	NO	
BOILER2	0	0.44100E+00	552100.0	4502900.0	243.5	12.19	433.15	12.70	1.07	NO	

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
KF_ORIG	FORM_1 , FURN_1 ,
KF_REV	FORM_2 , FURN_2 ,
ALL_ORIG	FORM_1 , FURN_1 , FUELSILO, PLANER , BOILER1 , BOILER2 ,
ALL_REV	FORM_2 , FURN_2 , FUELSILO, PLANER , BOILER1 , BOILER2 ,

*** THE SUMMARY OF MAXIMUM ANNUAL (8784 HRS) RESULTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	NETWORK GRID-ID
KF_ORIG	1ST HIGHEST VALUE IS	0.51243	AT (550400.00, 4500600.00, 361.00, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.50080	AT (551300.00, 4503900.00, 317.30, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.49457	AT (551300.00, 4503800.00, 311.70, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.49190	AT (551400.00, 4503800.00, 302.70, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.48127	AT (551400.00, 4504000.00, 307.00, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.48122	AT (551500.00, 4504100.00, 309.70, 0.00)	DC	NA
KF_REV	1ST HIGHEST VALUE IS	0.62929	AT (551689.00, 4500254.50, 224.40, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.60889	AT (551734.00, 4500303.00, 225.40, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.57983	AT (551737.00, 4500352.00, 223.50, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.57078	AT (551731.00, 4500254.00, 223.90, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.56793	AT (551647.00, 4500254.50, 221.20, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.54756	AT (551740.00, 4500401.00, 221.30, 0.00)	DC	NA
ALL_ORIG	1ST HIGHEST VALUE IS	5.05116	AT (552000.00, 4503300.00, 256.90, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	4.70010	AT (552100.00, 4503300.00, 251.00, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	4.69571	AT (552200.00, 4503300.00, 262.30, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	4.68080	AT (552200.00, 4503200.00, 269.10, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	4.34670	AT (552200.00, 4503100.00, 257.50, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	4.27131	AT (552100.00, 4503400.00, 253.10, 0.00)	DC	NA
ALL_REV	1ST HIGHEST VALUE IS	5.04530	AT (552000.00, 4503300.00, 256.90, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	4.69552	AT (552100.00, 4503300.00, 251.00, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	4.68722	AT (552200.00, 4503300.00, 262.30, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	4.66933	AT (552200.00, 4503200.00, 269.10, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	4.34370	AT (552200.00, 4503100.00, 257.50, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	4.26441	AT (552100.00, 4503400.00, 253.10, 0.00)	DC	NA

```
*** ISC3P - VERSION 01228 ***
*** Knauf Shasta Lake                                                   ***
*** Model Executed on 05/19/03 at 19:17:16 ***
 Input File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual PM 89.DTA

Output File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual PM 89.LST

   Met File - D:\modeling\Knauf - Shasta Lake\Modeling\Met Data\redc89.asc

      Number of sources -          8
Number of source groups -          4
    Number of receptors -       8103
```

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
FORM_1	0	0.54936E+01	551570.2	4500723.5	225.0	60.66	360.93	10.03	5.18	YES	
FURN_1	0	0.12600E-01	551581.7	4500632.5	224.0	25.91	352.59	21.12	0.53	YES	
FORM_2	0	0.27216E+01	551570.2	4500723.5	225.0	60.66	331.87	9.04	5.18	YES	
FURN_2	0	0.12600E+00	551581.7	4500632.5	224.0	25.91	319.43	16.67	0.94	YES	
FUELSILO	0	0.36288E+00	552100.0	4502900.0	243.5	13.11	291.48	7.37	1.52	NO	
PLANER	0	0.44730E+00	552100.0	4502900.0	243.5	18.29	291.48	9.08	1.52	NO	
BOILER1	0	0.63000E+00	552100.0	4502900.0	243.5	14.94	552.59	20.27	0.91	NO	
BOILER2	0	0.44100E+00	552100.0	4502900.0	243.5	12.19	433.15	12.70	1.07	NO	

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
KF_ORIG	FORM_1 , FURN_1 ,
KF_REV	FORM_2 , FURN_2 ,
ALL_ORIG	FORM_1 , FURN_1 , FUELSILO, PLANER , BOILER1 , BOILER2 ,
ALL_REV	FORM_2 , FURN_2 , FUELSILO, PLANER , BOILER1 , BOILER2 ,

*** THE SUMMARY OF MAXIMUM ANNUAL (8760 HRS) RESULTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC		XR	YR	ZELEV	ZFLAG	OF TYPE	NETWORK GRID-ID
KF_ORIG	1ST HIGHEST VALUE IS	0.50440	AT (	551300.00,	4503900.00,	317.30,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.50054	AT (	551400.00,	4503800.00,	302.70,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.49913	AT (	551300.00,	4503800.00,	311.70,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.48718	AT (	551400.00,	4504000.00,	307.00,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.48619	AT (	551400.00,	4503700.00,	293.00,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.48413	AT (	551500.00,	4504100.00,	309.70,	0.00)	DC	NA
KF_REV	1ST HIGHEST VALUE IS	0.62728	AT (	551689.00,	4500254.50,	224.40,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.58666	AT (	551647.00,	4500254.50,	221.20,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.58212	AT (	551734.00,	4500303.00,	225.40,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.56260	AT (	551731.00,	4500254.00,	223.90,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.54009	AT (	551700.00,	4500200.00,	222.70,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.53350	AT (	551737.00,	4500352.00,	223.50,	0.00)	DC	NA
ALL_ORIG	1ST HIGHEST VALUE IS	4.89853	AT (	552100.00,	4503300.00,	251.00,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	4.67360	AT (	552000.00,	4503300.00,	256.90,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	4.63349	AT (	552200.00,	4503200.00,	269.10,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	4.53848	AT (	552200.00,	4503300.00,	262.30,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	4.46572	AT (	552100.00,	4503400.00,	253.10,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	4.16371	AT (	552200.00,	4503100.00,	257.50,	0.00)	DC	NA
ALL_REV	1ST HIGHEST VALUE IS	4.89032	AT (	552100.00,	4503300.00,	251.00,	0.00)	DC	NA
	2ND HIGHEST VALUE IS	4.66121	AT (	552000.00,	4503300.00,	256.90,	0.00)	DC	NA
	3RD HIGHEST VALUE IS	4.61656	AT (	552200.00,	4503200.00,	269.10,	0.00)	DC	NA
	4TH HIGHEST VALUE IS	4.52524	AT (	552200.00,	4503300.00,	262.30,	0.00)	DC	NA
	5TH HIGHEST VALUE IS	4.45409	AT (	552100.00,	4503400.00,	253.10,	0.00)	DC	NA
	6TH HIGHEST VALUE IS	4.15740	AT (	552200.00,	4503100.00,	257.50,	0.00)	DC	NA

*** ISC3P - VERSION 01228 ***
*** Knauf Shasta Lake ***
*** Model Executed on 05/19/03 at 19:23:32 ***
Input File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual PM 90.DTA

Output File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual PM 90.LST

Met File - D:\modeling\Knauf - Shasta Lake\Modeling\Met Data\redc90.asc

Number of sources - 8
Number of source groups - 4
Number of receptors - 8103

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
FORM_1	0	0.54936E+01	551570.2	4500723.5	225.0	60.66	360.93	10.03	5.18	YES	
FURN_1	0	0.12600E-01	551581.7	4500632.5	224.0	25.91	352.59	21.12	0.53	YES	
FORM_2	0	0.27216E+01	551570.2	4500723.5	225.0	60.66	331.87	9.04	5.18	YES	
FURN_2	0	0.12600E+00	551581.7	4500632.5	224.0	25.91	319.43	16.67	0.94	YES	
FUELSILO	0	0.36288E+00	552100.0	4502900.0	243.5	13.11	291.48	7.37	1.52	NO	
PLANER	0	0.44730E+00	552100.0	4502900.0	243.5	18.29	291.48	9.08	1.52	NO	
BOILER1	0	0.63000E+00	552100.0	4502900.0	243.5	14.94	552.59	20.27	0.91	NO	
BOILER2	0	0.44100E+00	552100.0	4502900.0	243.5	12.19	433.15	12.70	1.07	NO	

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
KF_ORIG	FORM_1 , FURN_1 ,
KF_REV	FORM_2 , FURN_2 ,
ALL_ORIG	FORM_1 , FURN_1 , FUELSILO, PLANER , BOILER1 , BOILER2 ,
ALL_REV	FORM_2 , FURN_2 , FUELSILO, PLANER , BOILER1 , BOILER2 ,

*** THE SUMMARY OF MAXIMUM ANNUAL (8760 HRS) RESULTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	NETWORK GRID-ID
KF_ORIG	1ST HIGHEST VALUE IS	0.48883 AT	(551300.00, 4503900.00, 317.30, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.48593 AT	(551400.00, 4503800.00, 302.70, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.48473 AT	(550500.00, 4500700.00, 355.40, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.48198 AT	(551300.00, 4503800.00, 311.70, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.47803 AT	(551500.00, 4504100.00, 309.70, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.47625 AT	(551400.00, 4504000.00, 307.00, 0.00)	DC	NA
KF_REV	1ST HIGHEST VALUE IS	0.65499 AT	(551689.00, 4500254.50, 224.40, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.61011 AT	(551734.00, 4500303.00, 225.40, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.61004 AT	(551647.00, 4500254.50, 221.20, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.59020 AT	(551731.00, 4500254.00, 223.90, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.57549 AT	(551737.00, 4500352.00, 223.50, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.57017 AT	(551700.00, 4500200.00, 222.70, 0.00)	DC	NA
ALL_ORIG	1ST HIGHEST VALUE IS	5.05229 AT	(552200.00, 4503200.00, 269.10, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	4.90494 AT	(552200.00, 4503300.00, 262.30, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	4.90187 AT	(552000.00, 4503300.00, 256.90, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	4.84761 AT	(552100.00, 4503300.00, 251.00, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	4.68941 AT	(552200.00, 4503100.00, 257.50, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	4.42700 AT	(552100.00, 4503400.00, 253.10, 0.00)	DC	NA
ALL_REV	1ST HIGHEST VALUE IS	5.03412 AT	(552200.00, 4503200.00, 269.10, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	4.88999 AT	(552000.00, 4503300.00, 256.90, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	4.88975 AT	(552200.00, 4503300.00, 262.30, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	4.83700 AT	(552100.00, 4503300.00, 251.00, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	4.68087 AT	(552200.00, 4503100.00, 257.50, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	4.41352 AT	(552100.00, 4503400.00, 253.10, 0.00)	DC	NA

```
*** ISC3P - VERSION 01228 ***
 *** Knauf Shasta Lake                                                        ***
 *** Model Executed on 05/19/03 at 19:29:29 ***
  Input File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual PM 91.DTA

 Output File - d:\modeling\Knauf - Shasta Lake\Modeling\Annual PM 91.LST

    Met File - D:\modeling\Knauf - Shasta Lake\Modeling\Met Data\redc91.asc

       Number of sources -          8
 Number of source groups -          4
     Number of receptors -       8103
```

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
FORM_1	0	0.54936E+01	551570.2	4500723.5	225.0	60.66	360.93	10.03	5.18	YES	
FURN_1	0	0.12600E-01	551581.7	4500632.5	224.0	25.91	352.59	21.12	0.53	YES	
FORM_2	0	0.27216E+01	551570.2	4500723.5	225.0	60.66	331.87	9.04	5.18	YES	
FURN_2	0	0.12600E+00	551581.7	4500632.5	224.0	25.91	319.43	16.67	0.94	YES	
FUELSILO	0	0.36288E+00	552100.0	4502900.0	243.5	13.11	291.48	7.37	1.52	NO	
PLANER	0	0.44730E+00	552100.0	4502900.0	243.5	18.29	291.48	9.08	1.52	NO	
BOILER1	0	0.63000E+00	552100.0	4502900.0	243.5	14.94	552.59	20.27	0.91	NO	
BOILER2	0	0.44100E+00	552100.0	4502900.0	243.5	12.19	433.15	12.70	1.07	NO	

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
KF_ORIG	FORM_1 , FURN_1 ,
KF_REV	FORM_2 , FURN_2 ,
ALL_ORIG	FORM_1 , FURN_1 , FUELSILO, PLANER , BOILER1 , BOILER2 ,
ALL_REV	FORM_2 , FURN_2 , FUELSILO, PLANER , BOILER1 , BOILER2 ,

*** THE SUMMARY OF MAXIMUM ANNUAL (8760 HRS) RESULTS ***

** CONC OF PM10 IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	NETWORK GRID-ID
KF_ORIG	1ST HIGHEST VALUE IS	0.55123 AT	(551300.00, 4503900.00, 317.30, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.54666 AT	(551300.00, 4503800.00, 311.70, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.52509 AT	(551400.00, 4503800.00, 302.70, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.51312 AT	(551300.00, 4504000.00, 314.60, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.50930 AT	(551400.00, 4504000.00, 307.00, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.50712 AT	(551400.00, 4503700.00, 293.00, 0.00)	DC	NA
KF_REV	1ST HIGHEST VALUE IS	0.58124 AT	(551647.00, 4500254.50, 221.20, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	0.53448 AT	(551689.00, 4500254.50, 224.40, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	0.51706 AT	(551605.00, 4500255.00, 219.90, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	0.51145 AT	(551734.00, 4500303.00, 225.40, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	0.50035 AT	(551737.00, 4500352.00, 223.50, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.47723 AT	(551740.00, 4500401.00, 221.30, 0.00)	DC	NA
ALL_ORIG	1ST HIGHEST VALUE IS	5.51613 AT	(552200.00, 4503200.00, 269.10, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	5.43966 AT	(552000.00, 4503300.00, 256.90, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	5.21287 AT	(552200.00, 4503300.00, 262.30, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	4.94750 AT	(552100.00, 4503300.00, 251.00, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	4.64800 AT	(552200.00, 4503100.00, 257.50, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	4.48747 AT	(552100.00, 4503400.00, 253.10, 0.00)	DC	NA
ALL_REV	1ST HIGHEST VALUE IS	5.49581 AT	(552200.00, 4503200.00, 269.10, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	5.42328 AT	(552000.00, 4503300.00, 256.90, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	5.19620 AT	(552200.00, 4503300.00, 262.30, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	4.93615 AT	(552100.00, 4503300.00, 251.00, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	4.63950 AT	(552200.00, 4503100.00, 257.50, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	4.47254 AT	(552100.00, 4503400.00, 253.10, 0.00)	DC	NA

Appendix D

Modeling Isopleths

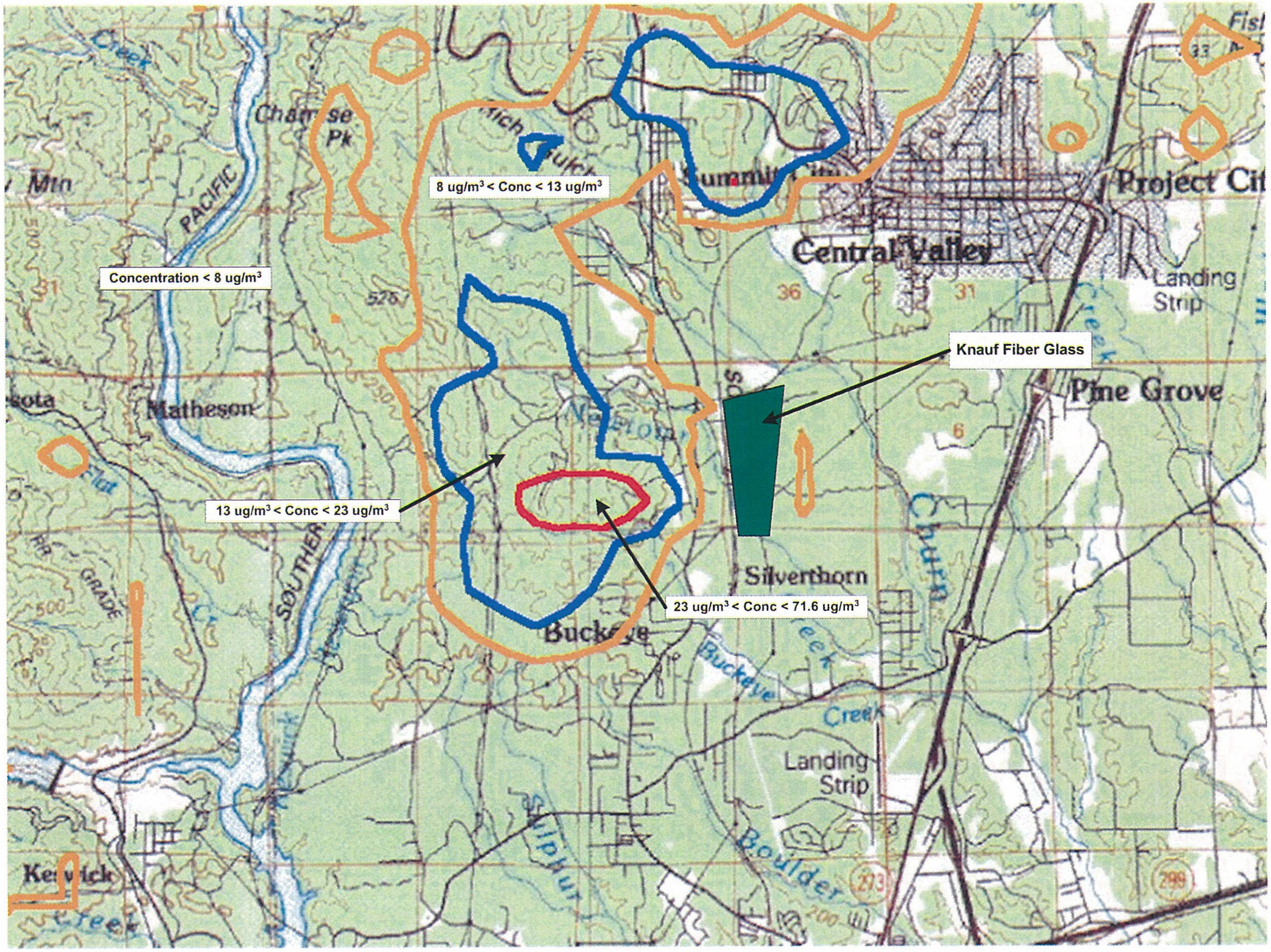

Figure D.1. Maximum 1-Hour NO_x Impacts From Knauf (1987-1991 Meteorological Data)

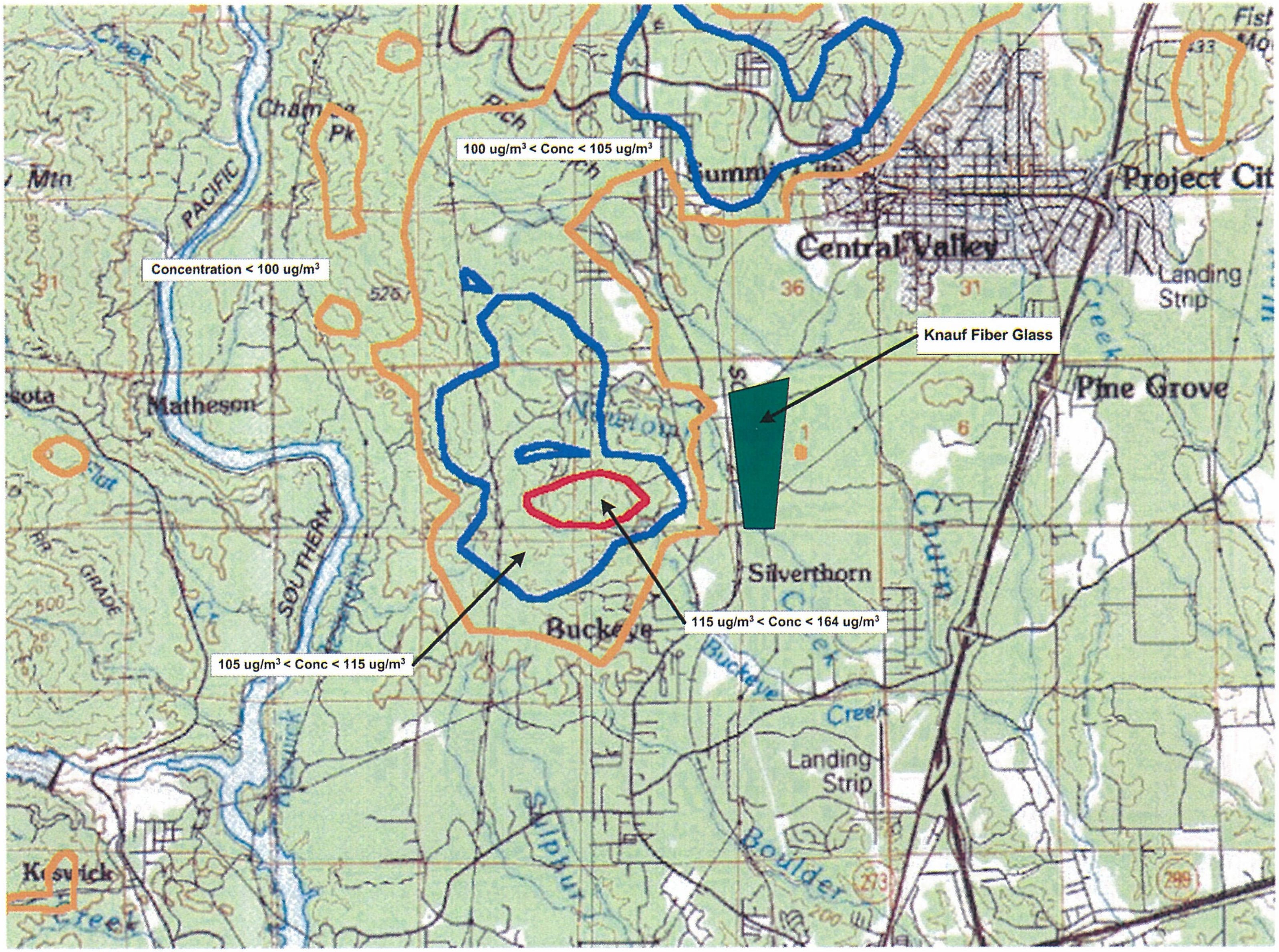

Figure D.2. Maximum 1-Hour NO_x Impacts From Knauf - Includes Background Concentration (1987-1991 Met. Data)

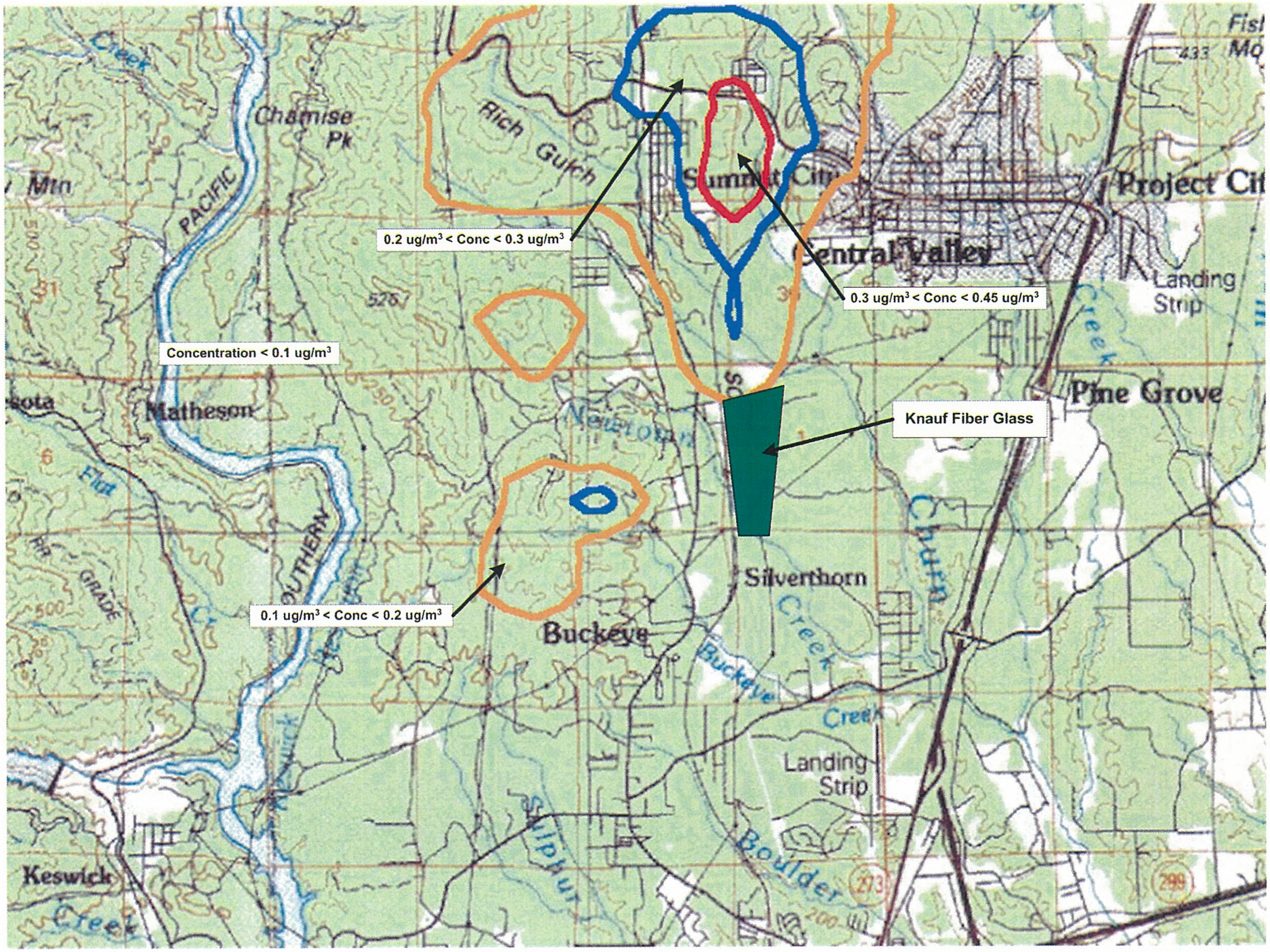

Figure D.3. Maximum Annual NO_x Impacts From Knauf (1987 Meteorological Data)

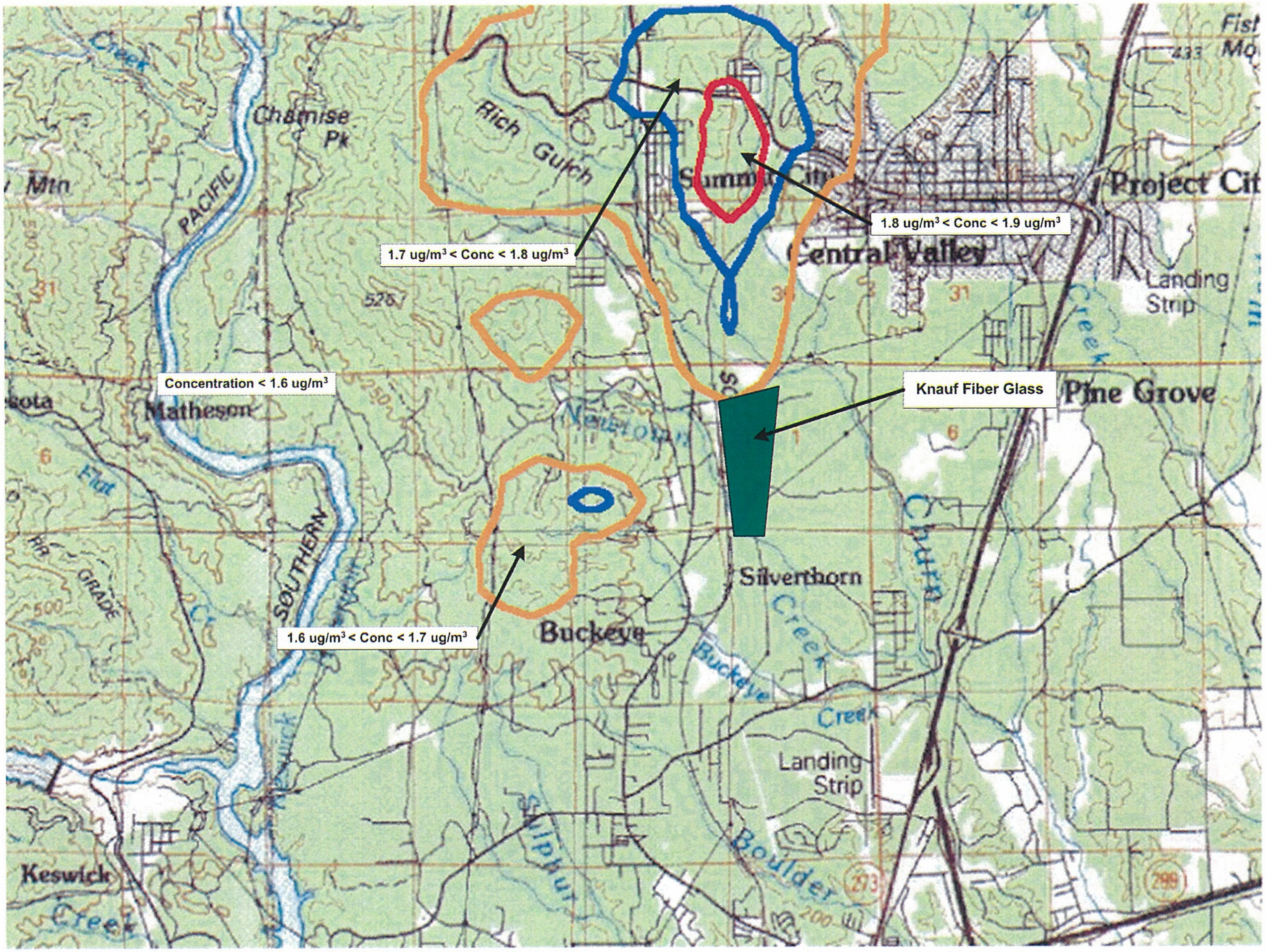

Figure D.4. Maximum Annual NO_x Impacts From Knauf - Includes Background Concentration (1987 Meteorological Data)

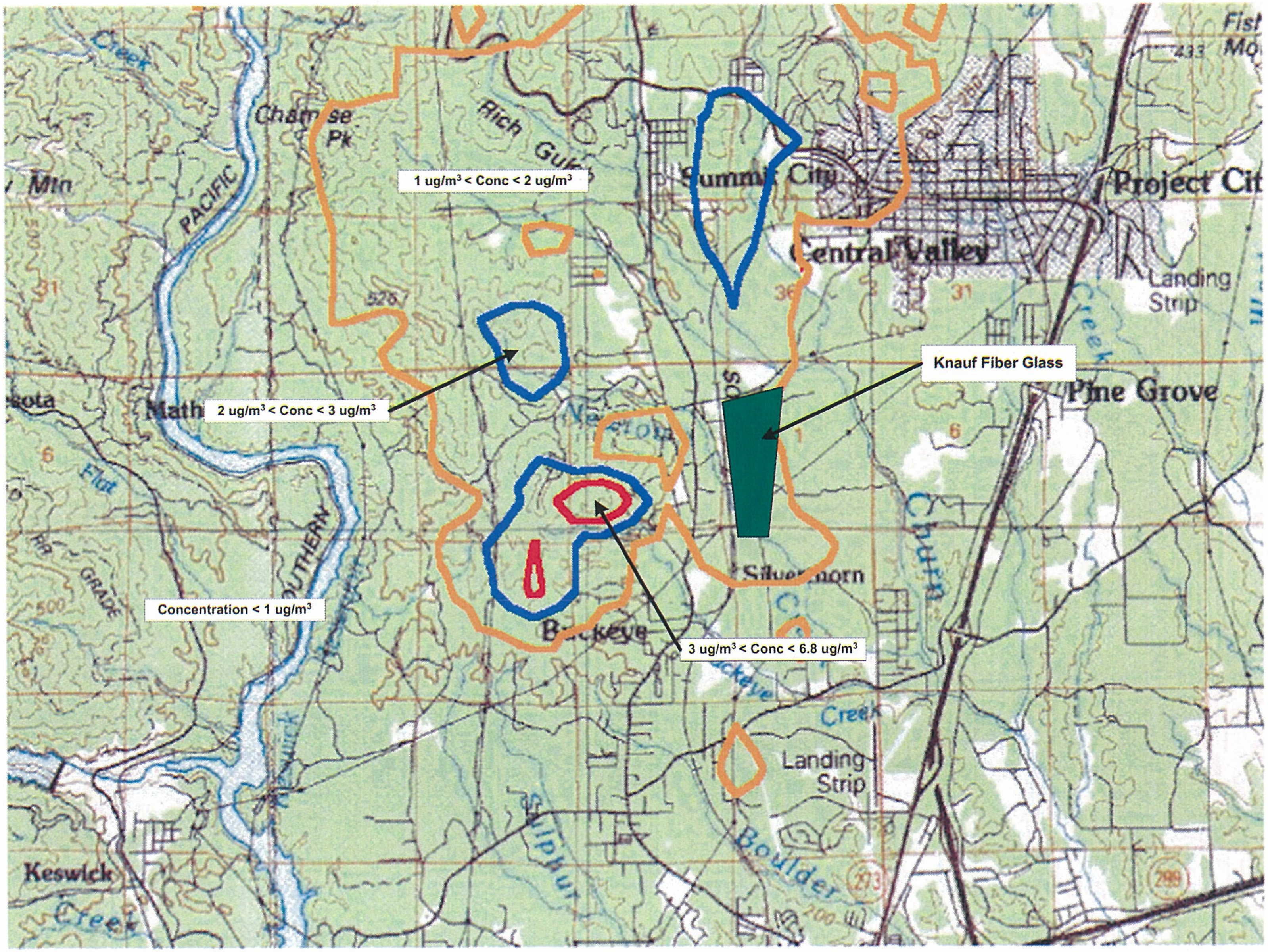

Figure D.5. Maximum 24-Hour PM_{10} Impacts From Knauf (1987-1991 Meteorological Data)

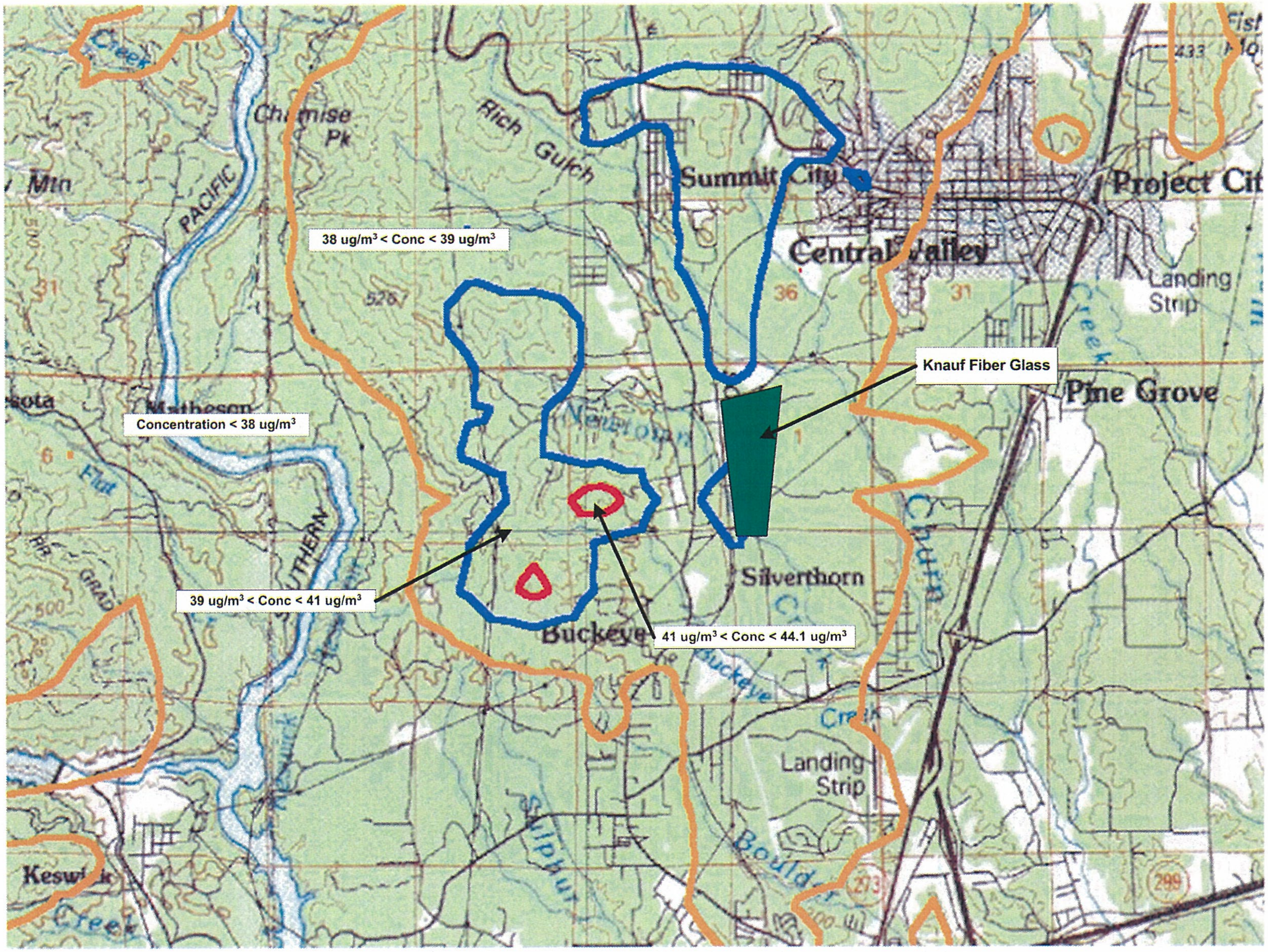

Figure D.6. Maximum 24-Hour PM_{10} Impacts From Knauf – Includes Background Concentration (1987-1991 Met. Data)

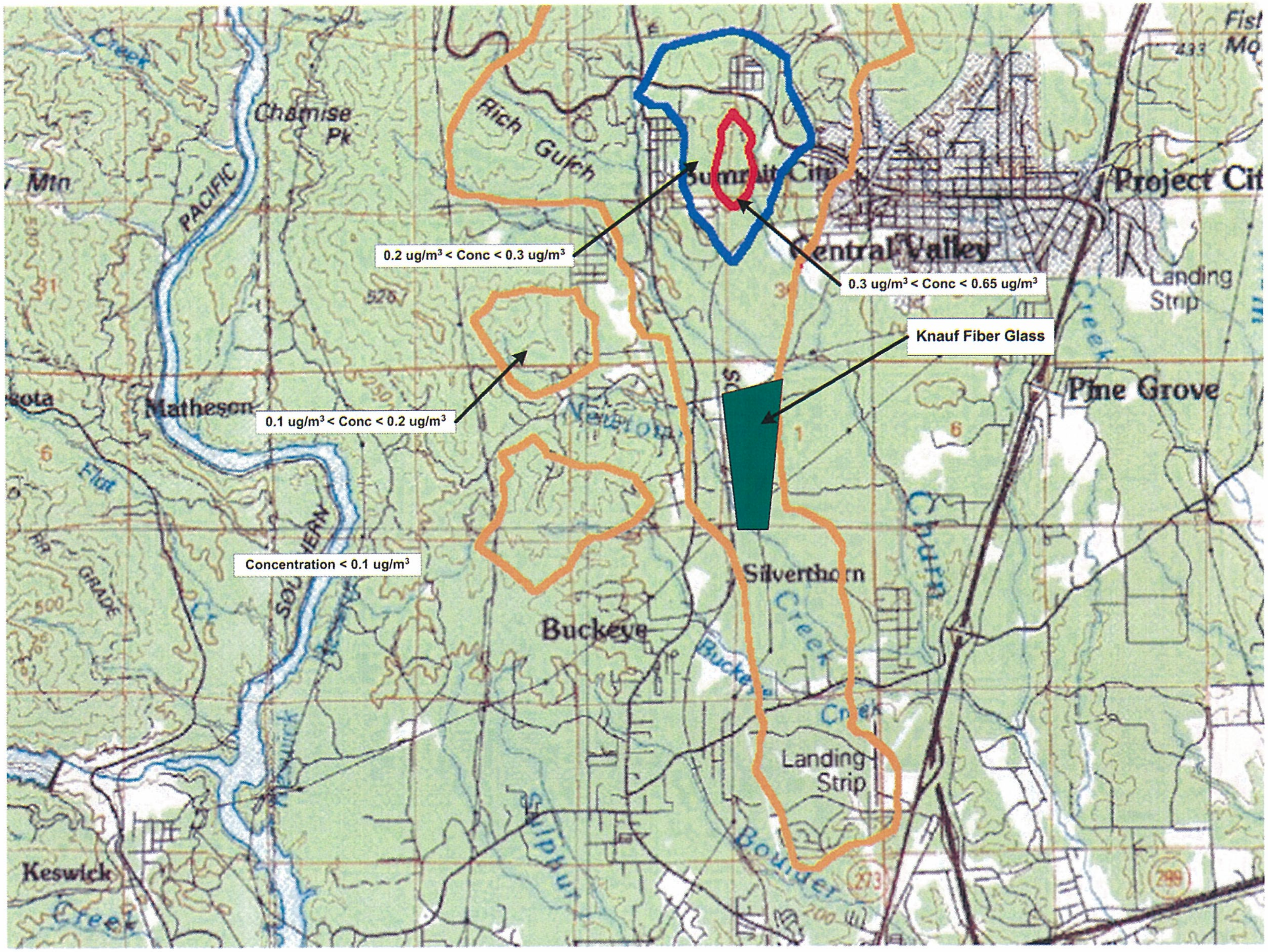

Figure D.7. Maximum Annual PM_{10} Impacts From Knauf (1990 Meteorological Data)

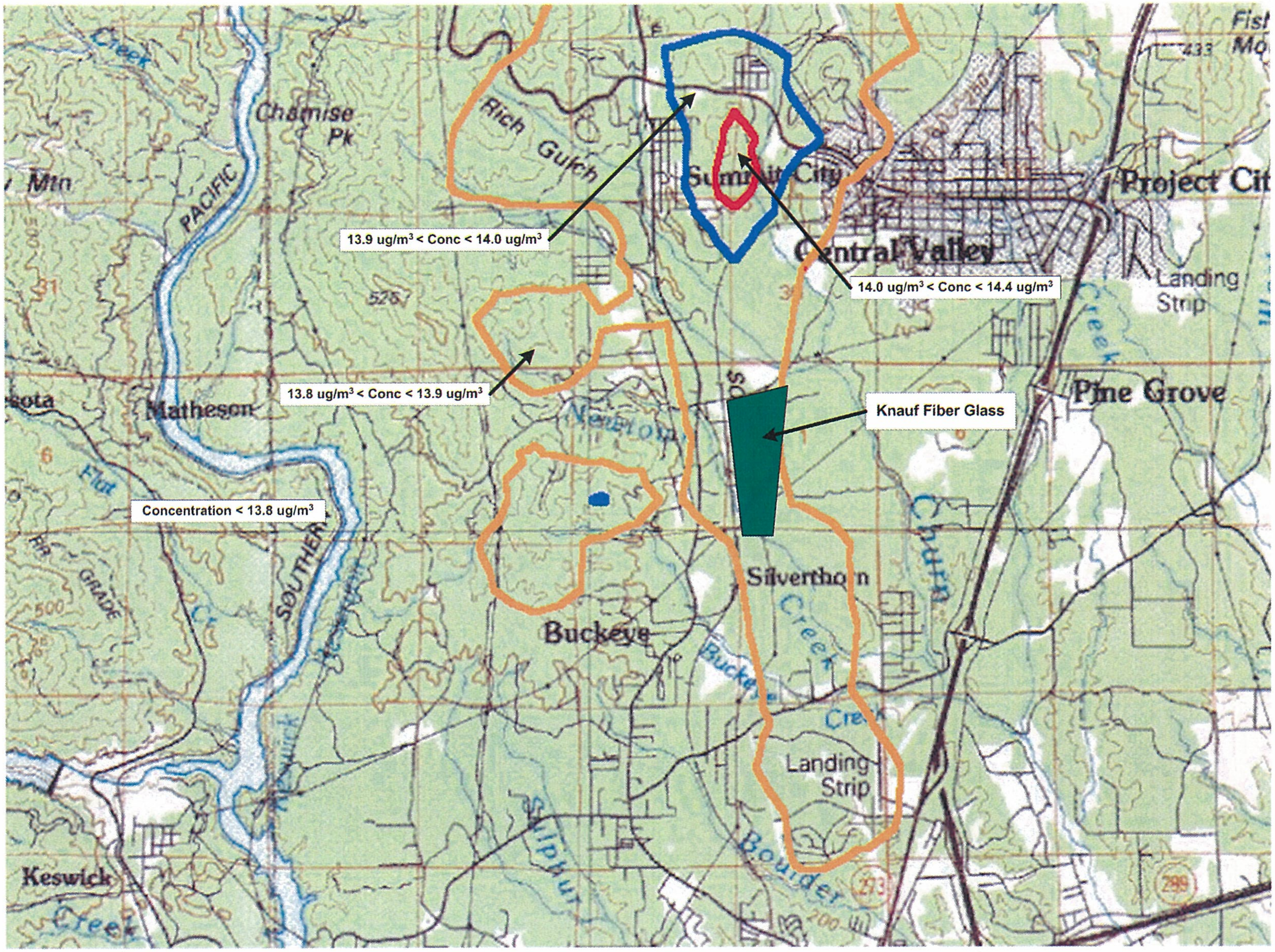

Figure D.8. Maximum Annual PM_{10} Impacts From Knauf – Includes Background Concentration (1990 Meteorological Data)

Appendix E

Original PSD Permit

KNAUF FIBER GLASS
PSD AUTHORITY TO CONSTRUCT

EQUIPMENT UNDER PERMIT

RAW MATERIALS HANDLING AND MIXING (#97-PO-26)

1 ea. Raw Material Unloading Dust Collector
1 ea. Sand Bins Dust Collector
1 ea. Consumer Cullet Bin Dust Collector
1 ea. Dolomite Bin Dust Collector
1 ea. Limestone Bin Dust Collector
1 ea. (Spare) Bin Dust Collector
1 ea. Borax Bin Dust Collector
1 ea. Soda Ash Bin Dust Collector
1 ea. Feldspar Bin Dust Collector
1 ea. Knauf Cullet Dust Collector
1 ea. Weigh Scales/Conveyor Dust Collector
1 ea. Check Scale/Batch Mixer Dust Collector
1 ea. Day Bin #1 Dust Collector
1 ea. Day Bin #2 Dust Collector
1 ea. Liquid Urea Tank
2 ea. Phenolic Resin Tanks
2 ea. Resin-Urea Premix Tanks
1 ea. Outdoor Mineral Oil Tank
1 ea. Outdoor Aqueous Ammonia Tank
2 ea. Ammonium Sulfate Mix Tanks
1 ea. Organosilane Weigh Tank
1 ea. Binder Mix Tank
2 ea. Binder Supply Hold Tanks

GLASS MELTING (#97-PO-27)

195 Tons/Day Molten Glass Production Electric Glass Melting Furnace
Two (2)ea. 7681 DSCFM, GMD Pulse Jet Dust Collectors(Mod.2-169-10-6RA)

FIBERGLASS FORMING/CURING/COOLING (#97-PO-28)

1 ea. Natural Gas-Fired Forming Section
1 ea. Natural Gas-Fired Curing Oven (low NOx/CO Burners)
1 ea. Volatile Organic Compound Binder Application Process
6 ea. 10"_P Venturi Scrubbers on Bonded Wool Forming Line
1 ea. 10"_P Venturi Scrubber on Blowing Wool Forming Line
1 ea. 400,000 ACFM, 600 GPM Wet Electrostatic Precipitator
2 ea. 1400° Thermal Oxidizers (low NOx/CO Burners) on Curing Oven
1 ea. Settling Chamber/Air Washer on Cooling Line

FIBERGLASS TRIMMING AND PACKAGING (#97-PO-29)

1 ea 9874 ACFM Trimming-Packaging Cyclone (1) & Dust Collector Assembly
1 ea 9874 ACFM Class B Blowing Wool Cyclones (2) & Dust Collector Assembly
1 ea 15,708 ACFM Class A Blowing Wool Cyclone (1) & Dust Collector Assembly
1 ea 15,708 ACFM Class A Blowing Wool Bagger Dust Collector Assembly
4 ea High Density Filter Modules

SEE CONDITIONS ON ATTACHMENTS

KNAUF FIBER GLASS

PSD AUTHORITY TO CONSTRUCT

GENERAL PERMIT CONDITIONS
(Applies to all emission units under this permit.)

1. This Authority to Construct (PSD Permit) is issued in accordance with the rules and regulations of the District and pursuant to the delegation of PSD authority by the Environmental Protection Agency (EPA), Region 9, on July 8, 1985. If any provision of this permit is found invalid, such finding shall not affect the remaining provisions.

2. In the event of any changes in control or ownership of facilities to be constructed or modified, this Authority to Construct (PSD Permit) shall be binding on all subsequent owners and operators. The applicant shall notify the succeeding owner and operator of the existence of this Authority to Construct (PSD Permit) and its conditions by letter, a copy of which shall be forwarded to the Air Pollution Control Officer (APCO) of the Shasta County Air Quality Management District (District), the California Air Resources Board (CARB), and the EPA.

3. Equipment is to be maintained so that it operates as it did when the permit was issued. Any anticipated production expansion beyond the 195 Tons/day limit found in Condition #35 of this permit is prohibited without separate application for a new Authority to Construct and Permit to Operate from the District. Any change in equipment, method of operation, fuel use, or process which may cause an emission increase, shall be reported to the District at least 30 days prior to taking any action or seeking other permits regarding such change in order for the District to determine if an application for an Authority to Construct is necessary.

4. This Authority to Construct (PSD Permit) shall be valid for a period of two (2) years from the issuance date in accordance with District Rule 2:12.

5. Acceptance of this permit is deemed acceptance of all conditions as specified. All equipment, facilities, and systems shall be designed and operated in a manner that maintains compliance with the conditions of this permit, applicable provisions of 40 CFR Parts 52, 60, 61, 63 and any other applicable local, State, or Federal regulations. Failure to comply with any condition of this permit or the Rules and Regulations of the District shall be grounds for revocation, either by the APCO or the District Hearing Board.

6. The District reserves the right to amend this permit, if the need arises, in order to insure compliance of this facility with applicable local, State, or Federal regulations, or to abate any public nuisance.

7. Periods of excess emissions, upsets, breakdowns, or malfunctions shall be reported to the District, in accordance with District Rule 3:10, within four hours of occurrence. In no event shall the equipment be operated with the emission control equipment in a malfunctioning condition beyond the end of the work shift or 24 hours, whichever occurs first. If any emission control equipment or technology becomes inoperative or substantially impaired for any reason, including maintenance, to the degree of causing a violation of emission limitations, the owner/operator shall (1) immediately (within 15 minutes) cease all operations connected with that emission control equipment and (2) repair the equipment or technology to its prior efficiency before restarting operations.

8. This facility is subject to all applicable requirements of the Air Toxics "Hot Spots" Information and Assessment Act of 1987, as cited in *California Health and Safety Code* Sections 44300 *et seq.*

9. This facility is subject to the applicable provisions of Title V of the Federal Clean Air Act of 1990.

10. This facility is subject to the applicable provisions of the National Emission Standards for Hazardous Air Pollutants for Wool Fiberglass Manufacturing (40 CFR Part 63, Subpart NNN). Emission limits stated in the above provisions, however, do not supersede more stringent limits found in other conditions of this permit.

11. The right of entry described in *California Health and Safety Code* Section 41510, Division 26, shall apply at all times. The Regional Administrator of the EPA, the Executive Officer of the California Air Resources Board, the APCO, and/or their authorized representatives, upon the presentation of credentials shall be permitted:

    a. to enter upon the premises where the source is located or in which any records are required to be kept under the terms and conditions of this Authority to Construct; and

    b. at reasonable times to have access to and copy any records required to be kept under the terms and conditions of this Authority to Construct; and

    c. to inspect any equipment, operation, or method required in this Authority to Construct; and

    d. to sample emissions from any and all emission sources within the facility.

12. All records and emission test results requested to be kept under the terms and conditions of this Authority to Construct shall be retained for at least five years from the date of entry and be made available to the District staff upon request.

13. The operating staff with management authority at this facility shall be advised of and be familiar with all the conditions of this permit.

14. The owner/operator shall continuously employ at the facility site at least one staff person who maintains certification by the California Air Resources Board as a Visible Emission Evaluator capable of accurately discerning stack opacity.

15. During construction of this facility, the following fugitive emission control measures shall be implemented at the plant site:

    a. Suspend all grading operations when winds (including instantaneous gusts) exceed 20 miles per hour.

    b. Water active construction sites at least twice daily or as needed to control fugitive dust.
    c. Install wheel washers where vehicles enter and exit unpaved roads onto paved roads, or wash off trucks and any equipment leaving the site each trip.

    d. Sweep streets with a water sweeper at the end of each day if visible soil materials are carried onto adjacent public paved roads.

e. All trucks hauling dirt, sand, soil, or other loose materials should be covered or should maintain at least two (2) feet of freeboard (minimum vertical distance between the top of the load and the top of the trailer), in accordance with the requirements of California Vehicle Code Section 23114.

f. Re-establish ground cover on the construction site through seeding and watering as soon as possible, but no later than final occupancy.

16. Monthly emission reports shall be required to be submitted by the 15th of the month following data recording and shall include:

a. notification of all periods 3 minutes and longer in duration when opacity from stack #1, the combined exhaust stack for the glass melting furnace dust collectors, any baghouse, or any dust collector exceeds the specified limit and the reason for the excursion;

b. notification of all periods the opacity monitor on stack #1 or the opacity monitor on the combined exhaust stack for the glass melting furnace dust collectors was not functioning and the reasons for the same;

c. notification of all dates and times when process exhausts are vented without the use of the required control equipment and the reason for each instance.

d. notification of all dates and times of failure to achieve minimum control device operating parameters required by Conditions #46, #47, and #48.

e. written documentation of the quarterly calibrations of the monitoring devices required in Condition #50 and a report of corrective maintenance required as a result of the calibrations.

f. written documentation of monthly natural gas fuel consumption for the fiberizing/forming section and the oven/incineration section of the facility on a separate basis.

g. written documentation of the date and times when the firebox temperature in the thermal oxidizer required in Condition #47b is less than 1400°F.

h. written documentation of quantity of glass pulled to fiber on a daily basis and total for the month.

i. written documentation of corrective action taken to correct each event of malfunctioning operating or control equipment or any condition causing excessive emissions.

j. if no permit limitations were exceeded, the report must so state.

17. Periodic emission testing shall be required pursuant to District Rule 2:11.a.3.(f). Results of all emission testing shall be forwarded to the District for compliance verification. An emission testing protocol detailing

the methods of sampling and analysis shall be submitted to the District for approval 60 days prior to the initial testing and any subsequent test required under the above rule.

18. Newly graded areas where active construction ceases for more than ten (10) days shall be treated with a non-toxic dust suppressant compound and be left undisturbed.

19. References to rules, regulations, etc., within this permit shall be interpreted as referring to such rules and regulations in their present configuration and language as of the date of issuance of this permit.

20. The owner/operator shall provide all necessary emission offset requirements for ROG, NOx, and PM10 as specified by City of Shasta Lake Conditional Use Permit No. 96-07 prior to issuance of a District Permit to Operate for the facility. All emission offsets shall be approved by the District and be quantifiable, enforceable, and permanent. Any combination of the following shall be acceptable for use as emission offsets:

   a. Best Available Mitigation Measures (BAMMs) as listed in the Air Quality Element of the City's General Plan,

   b. Banked emission reduction credits as allowed by District Rule 2:2,

   c. District-approved measures such as, but not limited to, paving roads within approximately 2 miles of the project site which are not associated with the project. If paving roads is selected for use as a measure for providing emission offsets, the following minimum analyses shall be accomplished on each candidate road segment to the satisfaction of the District prior to finalizing the specific roads to be paved:

      1) Silt content of each road surface material
      2) Traffic study to determine mean vehicle speed, trip lengths, number of trips, vehicle types, etc.
      3) Precipitation data for calculating emissions shall be obtained from the Shasta Lake Fire Station

21. Fugitive and direct emissions, during facility operation including, but not limited to, any of the following, shall be controlled at all times the permitted emissions units are operating such that a public nuisance is not created beyond the plant property boundaries:

   a. dust from paved or unpaved roads or any non-vegetation-covered area;

   b. dust from materials-handling devices and/or storage areas;

   c. accumulation of dust on outside surfaces including, but not limited to, the buildings, outdoor equipment, support pads, road areas. Surfaces shall be cleaned on a regular basis as needed to prevent buildup and/or fugitive dust;

d. dust from waste handling including waste from the water filtration system, wet electrostatic precipitator, dust collectors and waste containing unusable fiberglass. Waste shall be stored and transported in closed containers and handled at all times in a manner that prevents dust from becoming a public nuisance or a health hazard. It shall be the responsibility of the facility owner/operator to insure that any and all contract or company carriers adhere to this condition;

e. odorous chemical releases.

22. Agency Notifications: Correspondence shall be forwarded to each of the following agencies as required by the specific Authority to Construct conditions:

1. Air Pollution Control Officer
Shasta County Air Quality Management District
1855 Placer Street, Suite 101
Redding, CA 96001

2. Chief, Enforcement Office (Attn: Air-5)
U.S.Environmental Protection Agency Region 9
75 Hawthorne Street
San Francisco, CA 94105

3. Chief, Stationary Source Control Division
California Air Resources Board
P.O. Box 2815
Sacramento, CA 95814

23. The owner/operator shall finance the purchase and installation of two (2) EPA-approved PM10 monitors and two (2) Federal Reference Method (FRM) PM2.5 monitors, related supplies, and calibration equipment. The monitors will be used as special purpose ambient air monitors by the District for measuring PM10 and PM2.5 concentration levels at locations chosen by the District to provide necessary monitor security and representative sampling of ambient emission impacts from construction and operation of the proposed facility. In choosing the location of the monitors, the District will give special consideration to any sensitive receptors surrounding the proposed facility and locate at least one (1) collocated monitoring site at a school near to the facility. The monitors will sample on the same schedule and use the identical procedures as the other District-owned PM10 ambient monitors. In addition, the owner/operator shall finance the District operation and maintenance of the special purpose monitors for up to one (1) year prior to, and for a minimum period of two (2) years after, the commencement of operation of the facility by reimbursing the District for all staff time, materials, mileage, etc. associated with such activity in accordance with District Rule 2:11a.3.(e). The special purpose monitoring program shall be reconsidered upon annual permit renewal thereafter.

24. The owner/operator shall install and maintain an on-site meteorological station at the subject facility. The station shall include the capability to measure temperature and wind pattern data (direction and velocity) and record the results on continuous chart paper or retain the data on a data acquisition system.

25. The owner/operator shall finance an ambient monitoring program conducted by District staff for fugitive respirable fiberglass particle impact levels at specific receptor locations chosen by District staff within

proximity of the facility. At least one (1) monitoring site shall be chosen at a school near to the facility. The monitoring will be conducted using a medium volume ambient air sampler equivalent to Hi-Q Model MRV-0523c and NIOSH Method 7400 analysis in accordance with a monitoring plan submitted by the owner/operator and approved by the District. The plan will be submitted to the District no later than 60 days prior to startup. The monitoring program shall continue for a minimum period of one (1) year following startup of the facility and be reconsidered upon annual permit renewal thereafter. The results of this monitoring program must demonstrate that the fiber concentrations in the ambient air must be below a level of significant health impact as defined by the State Office of Environmental Health Hazard Assessment.

26. The owner/operator shall notify the District within four (4) hours of receiving any odor-related or fugitive emission-related complaint and shall provide the following information to the District:

    a. date and time of contact

    b. complainant's name, location, and description of complaint

    c. status of plant operations during time of complaint

    d. investigation results and any action taken to remedy problem

    A log of all complaints received will be maintained by the owner/operator for a minimum of five (5) years from date of entry and will be made available to the District upon request.

27. The owner/operator shall submit equipment drawings and design details of all baghouses, wet scrubbers, wet electrostatic precipitators, thermal oxidizers, settling chambers, dust collectors, and filtration modules to the District for approval prior to purchasing such equipment.

28. The owner/operator shall have an independent testing laboratory analyze particulate matter obtained from the emission tests required by Condition #55 for content of glass fiber in accordance with NIOSH Method 7400, and the results of the quantification shall be submitted as part of the emission test report.

29. All on-site roads and all off-site direct access roads to the facility shall be paved prior to commencing operational startup.

KNAUF FIBER GLASS
PSD AUTHORITY TO CONSTRUCT

RAW MATERIALS HANDLING AND MIXING (#97-PO-26)

OPERATING CONDITIONS

30. The 12,000 gallon phenolic resin tanks, the 15,000 gallon washwater liquid tanks, and the 15,000 gallon liquid urea tanks (all venting indoors) shall comply with all portions of the Federal New Source Performance Standards (40 CFR 60, Subpart Kb, Standards of Performance for Volatile Organic Liquid Storage Vessels). Notification with respect to commencement of construction (30 day notice), anticipated date of startup (30 day notice), actual date of startup (within 15 days), and modifications which could increase emission rates (60 days or as soon as practicable) shall be provided to the EPA Administrator noted in Condition #22 in accordance with 40 CFR 60.7.

31. All of the material handling vents and tank vents that discharge into the interior of the batch plant building shall be controlled by twelve (12) baghouse dust collectors that shall not allow any fugitive dust emissions from the building. The dust collectors shall be equipped with bag leak detectors which shall be calibrated on a regular basis to assure reliability. An audible alarm shall sound in the control room to indicate a torn or leaking bag. Spare bags shall be kept on site for immediate replacement of leaking or torn bags. Day Bin #1 and #2 dust collector emissions in the furnace building shall ultimately be discharged through the forming section exhausts and be controlled by the forming line scrubbers and wet electrostatic precipitator. Emissions from these dust collectors will, therefore, be measured as emissions from the forming line main stack #1.

32. The mineral oil tank shall store only distillates having a Reid vapor pressure less than four (4) pounds.

33. All railcar and bottom-dump hopper truck unloading of raw materials shall be done with a "dust boot" that seals the gap between the discharge of the hopper and the delivery system. The dust collectors on the material handling system shall be operational whenever materials are being delivered.

KNAUF FIBER GLASS
PSD AUTHORITY TO CONSTRUCT

GLASS MELTING (#97-PO-27)

OPERATING CONDITIONS

34. The glass melting furnace shall be heated only by electricity. No other auxiliary fuels may be used except during cold startup of the melting furnace or during prolonged electrical outages beyond the control of the facility when portable natural gas burners may be used to bring the temperature of the refractory and raw materials up to operating temperature. The APCO shall be advised of the intended use of the portable burners at least 24 hours prior to startup.

35. Molten glass production from the glass melting furnace shall be limited to a total of 195 tons in any 24 hour period. A permanent record of daily production shall be maintained and shall be available for inspection by the District, EPA, or CARB.

36. The method of control of suspended particulate matter from the glass melting furnace shall be the use of two baghouse dust collectors capable of meeting the emission standards specified in this permit. The dust collectors shall be equipped with bag leak detectors which shall be calibrated on a regular basis as recommended by the manufacturer to assure reliability. An audible alarm shall sound in the control room to indicate a torn or leaking bag. The owner/operator must initiate corrective action within 1 hour of an alarm from the bag leak detection system and complete corrective actions in a timely manner according to the procedures developed in accordance with the requirements of Condition #10 of this permit. Spare bags shall be kept on site for immediate replacement of leaking or torn bags.

37. Best available control technology (BACT) for this emissions unit shall be defined as the following emission control technologies capable of meeting the emission standards specified in Condition #41 of this permit:

    a. Use of two baghouse dust collectors for the control of particulate matter on the glass melting furnace.

    b. Use of an all electric glass melting furnace for the control of NOx, CO, SOx, and ROG.

38. The owner/operator shall record hours of operation of the glass melting furnace on a daily basis and shall install, calibrate, and maintain the following continuous monitors:

    a. Continuous glass pull rate monitor that records glass pull rate on an hourly basis

    b. Continuous dust collector bag leak detection system that records relative particulate matter emissions.

    The above records shall be maintained by the owner/operator for a minimum of five (5) years from date of entry and will be made available for District, EPA, or CARB inspection upon request.

39. The owner/operator shall maintain and operate a stack gas opacity monitor on the stack combining the baghouse discharge exhausts (#3a and #3b) from the glass melting furnace at a location approved by the District. The continuous opacity monitor shall meet all applicable design and quality assurance requirements specified in the Federal Register Parts 40 CFR 60.13 and 40 CFR 60, Specification 1 of Appendix B. The opacity monitor shall be installed and operational prior to conducting performance testing required in Condition #41 of this permit. A computer data acquisition system which has the capability of interpreting the sampling data, providing a graphical trend analysis, and producing a summary report of all three (3) minute averages of opacity readings shall also be provided. (40 CFR 60.13(h).)

40. The opacity from the above stack shall not exceed 5 percent opacity for a period greater than three (3) minutes in any one (1) hour period. An audible alarm shall sound in the control room to indicate an opacity exceeding the above opacity limit.

41. Within 60 days of startup of the facility, an emission test for particulate matter and gaseous fluoride and performance testing of the continuous opacity monitoring system (COMS) shall be conducted on the stack receiving the combined dust collector exhausts from the glass melting furnace. CARB Methods 1-5 including filter and impinger catch shall be used for particulate matter testing and EPA Method 13B shall be used for gaseous fluoride testing. Performance testing of the COMS shall be in accordance with 40 CFR 60.8 and 40 CFR 60.13. These tests shall be performed by an independent testing firm while operating at design capacity. The District shall be notified at least thirty (30) days in advance of such test to allow a District staff member to be present to verify compliance. In lieu of the above mentioned test methods, equivalent methods may be used if approved by the APCO. Results of all stack tests shall be forwarded to the District for compliance verification.

Total particulate matter emissions from the stack of the combined baghouse discharge exhausts (#3a and #3b) from the glass melting furnace shall not exceed any of the following emission limitations:

0.10 pounds per hour

0.44 tons per year

The sum total emissions of fluoride from the glass melting furnace baghouse exhausts (#3a and #3b) shall not exceed 15 lbs/day (.625 lbs/hr) per District Rule 2:1. Part 301.

42. Sampling ports shall be provided on the stack receiving the combined dust collector exhausts from the glass melting furnace. A sampling platform shall be installed by the owner/operator or safe access shall be provided during emission testing. The location of the sampling ports, platform, and/or arrangement for access must be approved by the District prior to installation of the stack.

KNAUF FIBER GLASS
PSD AUTHORITY TO CONSTRUCT

FIBERGLASS FORMING/CURING/COOLING LINES (#97-PO-28)

OPERATING CONDITIONS

43. The glass forming lines shall comply with all portions of the Federal New Source Performance Standards (40 CFR 60, Subpart PPP, Standards of Performance for Glass Fiber Manufacturing). Notification with respect to commencement of construction (30 day notice), anticipated date of startup (30 day notice), actual date of startup (within 15 days), and modifications which could increase emission rates (60 days or as soon as practicable) shall be provided to the EPA Administrator noted in Condition #22 in accordance with 40 CFR 60.7.

44. Natural gas shall constitute the only fuel allowed for use in the forming and curing sections.

45. Molten glass feed rate to the forming line shall be limited to a total of 195 tons in any 24 hour period. The owner/operator shall maintain a District-approved log indicating the throughput of molten glass material in tons/day. The log shall be available for inspection by either the District, EPA, or CARB.

46. The opacity of the main stack exhaust #1, excluding condensed water vapor, shall not exceed 20 percent for a period greater than three (3) minutes in any one (1) hour period. An audible alarm shall sound in the control room to indicate an opacity exceeding the above opacity limit.

47. Best available control technology (BACT) for the emission units under this permit shall be defined as the following emission control technologies capable of meeting the emission standards specified in Condition #52 of this permit, which shall be required to be operating whenever fiberglass is being produced:

    a. Forming Sections: Use of combustion controls which minimize peak flame temperatures in the fiber forming process for control of NOx, CO, and SOx. Use of Knauf process technology, six (6) venturi scrubbers on the bonded wool forming line and one (1) venturi scrubber on the unbonded wool forming line (each with a minimum of 10"wc pressure drop), followed by a wet electrostatic precipitator with continuous water spray wash system and four (4) electrical fields (minimum) for the control of particulate matter and reactive organic gases (ROG).

    b. Curing Section: Use of low NOx/CO burners burning natural gas for the control of NOx, CO, and SOx. Use of two thermal oxidizers operating in parallel with a minimum temperature of 1400°F and a residence time of at least 0.5 second for the control of ROG and particulate matter. (A lower minimum operating temperature, not less then 1200°F, may be used for the thermal oxidizers if, through emission testing, it is demonstrated to the satisfaction of the APCO that the lower temperature offers an equivalent emission control of ROG and particulate matter as provided by the 1400 F minimum temperature.)

    c. Cooling Section: Use of a water-washed settling chamber for the control of particulate matter and ROG with exhaust immediately combined with high-temperature exhaust of the thermal oxidizers.

48. The owner/operator shall continuously operate and maintain the venturi scrubbers for the removal of suspended particulate matter and for the pretreatment of the gas upstream of the wet electrostatic precipitator. The scrubbers shall maintain a minimum gas pressure drop of 10 inches water across the venturi throat and a minimum water flow to each scrubber of 200 gal./min. The pressure drop and water flow parameters shall be measured and recorded continuously. The solids in the scrubber water shall be removed to the extent necessary and fresh make-up water added as required in order for the wet electrostatic precipitator exhaust to meet the emission limits in Condition #52 at all times of operation.

49. The owner/operator shall continuously operate and maintain a wet electrostatic precipitator for the control of suspended particulate matter from the outlet of the forming zone venturi scrubbers. The wet electrostatic precipitator shall maintain a minimum water flow and a minimum total corona power as established during initial emission testing to determine compliance with 40 CFR 60, Subpart PPP.

50. The owner/operator shall install, calibrate, maintain, and operate monitoring devices that measure the following parameters at the frequency and accuracy as noted in Table 1:

Table 1

Parameters	Recording Frequency	Accuracy
Gas pressure drop across each scrubber (in.H_20)	Continuous	±1" WC
Inlet water flow rate to each scrubber (GPM)	Continuous	±5% over range
Wet Electrostatic Precipitator inlet water flowrate (GPM)	Every 15 minutes	±5% over range
Wet Electrostatic Precipitator: Secondary current (Amps.) Secondary voltage (kV) Spark rate Corona power/T-R set per field Inlet temp. (°F)	Every 15 minutes	±5% over range
Thermal Oxidizer: Exhaust temperature	Continuous	±5% over range

Settling Chamber water flow rate (gph)	Every 15 minutes	±5% over range

All monitoring devices required for the above parameters are to be recalibrated quarterly in accordance with procedures under Section 60.13(b) of 40 CFR 60.

51. The wet electrostatic precipitator inlet water total solids shall be determined daily using reference Method 209A, "Total Residue Dried at 103-105 °C," in *Standard Methods for the Examination of Water and Wastewater*, 15th Edition, 1980.

52. Total emissions from the main stack #1 shall not exceed the values shown in Table 2:

Table 2

EMISSION LIMITS:	POUNDS/HOUR (3 HR. AVG.)	LBS/TON OF GLASS PULLED (3 HR. AVG.)	TEST METHODS
PM10(as TSP)	28.4	3.50	EPA 5E
NOX(as NO_2)	5.66	.70	EPA 7E
CO	22.3	2.74	EPA 10
SO2	1.0	.12	EPA 6C
Non-Methane Hydrocarbon (as CH_4)	9.0	1.1	CARB 100 EPA 18
Ammonia	38.0	4.7	Bay Area AQMD ST-1B
Formaldehyde	2.0	.25	EPA 316
Phenol	6.0	.74	Bay Area AQMD ST-16
Gaseous Fluoride	.625	.077	EPA 13B

53. Four sampling ports must be provided on the main stack (located on the same horizontal plane, 90 degrees apart, and at least two [2] duct diameters downstream, and one-half [1/2] duct diameters upstream of any flow disturbance) and shall consist of 4-inch female NPT couplings welded to the stack. The couplings shall be supplied with 4-inch pipe plugs. A sampling platform shall be installed on the main stack. The location of the sampling ports and design of the platform must be approved by the District prior to installation.

54. Sampling ports must be provided on the inlet and outlet of the wet electrostatic precipitator, and on the outlets of the thermal oxidizers for the purpose of determining emission control efficiency. A sampling platform or other means of providing safe access to the sampling ports shall be installed. The location of the sampling ports and platforms must be approved by the District prior to installation.

55. Within 60 days of startup of the facility, performance testing of the continuous opacity monitoring system (COMS) and emission tests for the pollutants listed in Table 2, using the specified methods (or alternative testing methods approved by the APCO), shall be conducted by an independent testing firm at each of the following locations as indicated in Table 3 (see Condition #28 for additional testing requirements):

Table 3

EMISSIONS TESTS (X): TEST LOCATION:	PM10 as TSP	NOX as NO_2	CO	SO2	NMHC as CH_4	NH_3	CH_2O	C_6H_6O	Fl_2
main stack #1	X	X	X	X	X	X	X	X	X
wet ESP exhaust	X	X	X		X				
wet ESP inlet	X				X				

NH_3 = Ammonia, CH_2O = Formaldehyde, C_6H_5OH = Phenol, Fl_2 = Gaseous Fluoride

Performance testing of the COMS shall be in accordance with 40 CFR 60.8 and 40 CFR 60.13.

These tests are for both compliance and control efficiency determinations and shall be performed while operating at design capacity producing the fiberglass product with the highest loss on ignition (LOI) expected to be produced. The District shall be notified at least thirty (30) days in advance of such test to allow a District staff member to be present for compliance verification. Results of all stack tests shall be forwarded to the District within 30 days of the test for compliance verification.

56. The owner/operator shall maintain and operate a stack gas opacity monitor at a location on the main stack (#1) approved by the District. The continuous opacity monitor shall meet all applicable design and quality assurance requirements specified in the Federal Register Parts 40 CFR 60.13 and 40 CFR 60, Specification 1 of Appendix B. A computer data acquisition system which has the capability of interpreting the sampling data, providing a graphical trend analysis, and producing a summary report of all three (3) minute averages of opacity readings shall also be provided. (40 CFR 60.13(h)).

57. Under no circumstances shall the owner/operator be allowed to operate the system with operational parameters beyond the limits specified in Conditions #45, #47, and # 48. The owner/operator shall take immediate action to bring the operational parameters to within the specified limits. Immediate action for the purpose of this condition shall be defined as within four (4) hours of the discovery of the exceedance.

FIBERGLASS TRIMMING AND PACKAGING (#97-PO-29)

OPERATING CONDITIONS

58. The method of control of suspended particulate matter from the bonded wool forming line trimming and packaging areas, the Class A unbonded blowing wool processing area, and the Class B blowing wool processing area of the plant shall be the use of four (4) dust collector assemblies each followed by a high density filter module which shall exhaust inside the Scrap Building and have no outside vent. The performance of the above systems shall be capable of meeting the emission standards specified by California OSHA for air quality inside the Scrap Building. The dust collectors shall be equipped with leak detectors which shall be calibrated on a regular basis as recommended by the manufacturer to assure reliability. An audible alarm shall sound in the control room to indicate a leak in the dust collector. Spare cartridges and bags shall be kept on site for immediate replacement of leaking dust collector components. The filter modules shall be equipped with differential pressure measuring devices for daily monitoring and recording of the pressure drop across each filter bank.

59. The owner/operator shall monitor and have records available for inspection by the District, EPA, or CARB for the following parameters on a daily basis:

    a. Hours of operation

    b. Production rates

    c. Leaks from the dust collectors

    d. Pressure drop across the filter modules

    The above records shall be maintained by the owner/operator for a minimum of five (5) years from date of entry and will be made available to the above-mentioned agencies upon request.

Mostardi Platt
Environmental

1520 Kensington Road, Suite 204
Oak Brook, Illinois 60523-2139
Phone 630-993-2100
Fax 630-993-9017
www.mostardiplattenv.com

Appendix E

Original PSD Permit

EXPIRATION DATE:
March 14, 2002

PERMIT NO:
97-PO-06

SHASTA COUNTY
DEPARTMENT OF RESOURCE MANAGEMENT
AIR QUALITY MANAGEMENT DISTRICT

KNAUF FIBER GLASS GmbH
(Applicant)

IS HEREBY GRANTED A

FEDERAL PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

AUTHORITY TO CONSTRUCT

SUBJECT TO CONDITIONS NOTED

A FIBERGLASS MANUFACTURING FACILITY
Consisting of the following emission units:

RAW MATERIALS HANDLING AND MIXING	(#97-PO-26)
GLASS MELTING	(#97-PO-27)
FIBERGLASS FORMING/CURING/COOLING	(#97-PO-28)
FIBERGLASS TRIMMING AND PACKAGING	(#97-PO-29)

AT **3100 DISTRICT DRIVE, SHASTA LAKE, CALIFORNIA 96019**

DATE ISSUED: March 14, 2000

APPROVED: ______________
Air Pollution Control Officer

SEE CONDITIONS ON ATTACHMENTS

KNAUF FIBER GLASS
PSD AUTHORITY TO CONSTRUCT

EQUIPMENT UNDER PERMIT

RAW MATERIALS HANDLING AND MIXING (#97-PO-26)

1 ea. Raw Material Unloading Dust Collector
1 ea. Sand Bins Dust Collector
1 ea. Consumer Cullet Bin Dust Collector
1 ea. Dolomite Bin Dust Collector
1 ea. Limestone Bin Dust Collector
1 ea. (Spare) Bin Dust Collector
1 ea. Borax Bin Dust Collector
1 ea. Soda Ash Bin Dust Collector
1 ea. Feldspar Bin Dust Collector
1 ea. Knauf Cullet Dust Collector
1 ea. Weigh Scales/Conveyor Dust Collector
1 ea. Check Scale/Batch Mixer Dust Collector
1 ea. Day Bin #1 Dust Collector
1 ea. Day Bin #2 Dust Collector
1 ea. Liquid Urea Tank
2 ea. Phenolic Resin Tanks
2 ea. Resin-Urea Premix Tanks
1 ea. Outdoor Mineral Oil Tank
1 ea. Outdoor Aqueous Ammonia Tank
2 ea. Ammonium Sulfate Mix Tanks
1 ea. Organosilane Weigh Tank
1 ea. Binder Mix Tank
2 ea. Binder Supply Hold Tanks

GLASS MELTING (#97-PO-27)

195 Tons/Day Molten Glass Production Electric Glass Melting Furnace
Two (2)ea. 7681 DSCFM, GMD Pulse Jet Dust Collectors(Mod.2-169-10-6RA)

FIBERGLASS FORMING/CURING/COOLING (#97-PO-28)

1 ea. Natural Gas-Fired Forming Section
1 ea. Natural Gas-Fired Curing Oven (low NOx/CO Burners)
1 ea. Volatile Organic Compound Binder Application Process
6 ea. 10"_P Venturi Scrubbers on Bonded Wool Forming Line
1 ea. 10"_P Venturi Scrubber on Blowing Wool Forming Line
1 ea. 400,000 ACFM, 600 GPM Wet Electrostatic Precipitator
2 ea. 1400^{o} Thermal Oxidizers (low NOx/CO Burners) on Curing Oven
1 ea. Settling Chamber/Air Washer on Cooling Line

FIBERGLASS TRIMMING AND PACKAGING (#97-PO-29)

1 ea 9874 ACFM Trimming-Packaging Cyclone (1) & Dust Collector Assembly
1 ea 9874 ACFM Class B Blowing Wool Cyclones (2) & Dust Collector Assembly
1 ea 15,708 ACFM Class A Blowing Wool Cyclone (1) & Dust Collector Assembly
1 ea 15,708 ACFM Class A Blowing Wool Bagger Dust Collector Assembly
4 ea High Density Filter Modules

SEE CONDITIONS ON ATTACHMENTS

KNAUF FIBER GLASS

PSD AUTHORITY TO CONSTRUCT

GENERAL PERMIT CONDITIONS
(Applies to all emission units under this permit.)

1. This Authority to Construct (PSD Permit) is issued in accordance with the rules and regulations of the District and pursuant to the delegation of PSD authority by the Environmental Protection Agency (EPA), Region 9, on July 8, 1985. If any provision of this permit is found invalid, such finding shall not affect the remaining provisions.

2. In the event of any changes in control or ownership of facilities to be constructed or modified, this Authority to Construct (PSD Permit) shall be binding on all subsequent owners and operators. The applicant shall notify the succeeding owner and operator of the existence of this Authority to Construct (PSD Permit) and its conditions by letter, a copy of which shall be forwarded to the Air Pollution Control Officer (APCO) of the Shasta County Air Quality Management District (District), the California Air Resources Board (CARB), and the EPA.

3. Equipment is to be maintained so that it operates as it did when the permit was issued. Any anticipated production expansion beyond the 195 Tons/day limit found in Condition #35 of this permit is prohibited without separate application for a new Authority to Construct and Permit to Operate from the District. Any change in equipment, method of operation, fuel use, or process which may cause an emission increase, shall be reported to the District at least 30 days prior to taking any action or seeking other permits regarding such change in order for the District to determine if an application for an Authority to Construct is necessary.

4. This Authority to Construct (PSD Permit) shall be valid for a period of two (2) years from the issuance date in accordance with District Rule 2:12.

5. Acceptance of this permit is deemed acceptance of all conditions as specified. All equipment, facilities, and systems shall be designed and operated in a manner that maintains compliance with the conditions of this permit, applicable provisions of 40 CFR Parts 52, 60, 61, 63 and any other applicable local, State, or Federal regulations. Failure to comply with any condition of this permit or the Rules and Regulations of the District shall be grounds for revocation, either by the APCO or the District Hearing Board.

6. The District reserves the right to amend this permit, if the need arises, in order to insure compliance of this facility with applicable local, State, or Federal regulations, or to abate any public nuisance.

7. Periods of excess emissions, upsets, breakdowns, or malfunctions shall be reported to the District, in accordance with District Rule 3:10, within four hours of occurrence. In no event shall the equipment be operated with the emission control equipment in a malfunctioning condition beyond the end of the work shift or 24 hours, whichever occurs first. If any emission control equipment or technology becomes inoperative or substantially impaired for any reason, including maintenance, to the degree of causing a violation of emission limitations, the owner/operator shall (1) immediately (within 15 minutes) cease all operations connected with that emission control equipment and (2) repair the equipment or technology to its prior efficiency before restarting operations.

8. This facility is subject to all applicable requirements of the Air Toxics "Hot Spots" Information and Assessment Act of 1987, as cited in *California Health and Safety Code* Sections 44300 *et seq.*

9. This facility is subject to the applicable provisions of Title V of the Federal Clean Air Act of 1990.

10. This facility is subject to the applicable provisions of the National Emission Standards for Hazardous Air Pollutants for Wool Fiberglass Manufacturing (40 CFR Part 63, Subpart NNN). Emission limits stated in the above provisions, however, do not supersede more stringent limits found in other conditions of this permit.

11. The right of entry described in *California Health and Safety Code* Section 41510, Division 26, shall apply at all times. The Regional Administrator of the EPA, the Executive Officer of the California Air Resources Board, the APCO, and/or their authorized representatives, upon the presentation of credentials shall be permitted:

    a. to enter upon the premises where the source is located or in which any records are required to be kept under the terms and conditions of this Authority to Construct; and

    b. at reasonable times to have access to and copy any records required to be kept under the terms and conditions of this Authority to Construct; and

    c. to inspect any equipment, operation, or method required in this Authority to Construct; and

    d. to sample emissions from any and all emission sources within the facility.

12. All records and emission test results requested to be kept under the terms and conditions of this Authority to Construct shall be retained for at least five years from the date of entry and be made available to the District staff upon request.

13. The operating staff with management authority at this facility shall be advised of and be familiar with all the conditions of this permit.

14. The owner/operator shall continuously employ at the facility site at least one staff person who maintains certification by the California Air Resources Board as a Visible Emission Evaluator capable of accurately discerning stack opacity.

15. During construction of this facility, the following fugitive emission control measures shall be implemented at the plant site:

    a. Suspend all grading operations when winds (including instantaneous gusts) exceed 20 miles per hour.

    b. Water active construction sites at least twice daily or as needed to control fugitive dust.
    c. Install wheel washers where vehicles enter and exit unpaved roads onto paved roads, or wash off trucks and any equipment leaving the site each trip.

    d. Sweep streets with a water sweeper at the end of each day if visible soil materials are carried onto adjacent public paved roads.

e. All trucks hauling dirt, sand, soil, or other loose materials should be covered or should maintain at least two (2) feet of freeboard (minimum vertical distance between the top of the load and the top of the trailer), in accordance with the requirements of California Vehicle Code Section 23114.

f. Re-establish ground cover on the construction site through seeding and watering as soon as possible, but no later than final occupancy.

16. Monthly emission reports shall be required to be submitted by the 15th of the month following data recording and shall include:

a. notification of all periods 3 minutes and longer in duration when opacity from stack #1, the combined exhaust stack for the glass melting furnace dust collectors, any baghouse, or any dust collector exceeds the specified limit and the reason for the excursion;

b. notification of all periods the opacity monitor on stack #1 or the opacity monitor on the combined exhaust stack for the glass melting furnace dust collectors was not functioning and the reasons for the same;

c. notification of all dates and times when process exhausts are vented without the use of the required control equipment and the reason for each instance.

d. notification of all dates and times of failure to achieve minimum control device operating parameters required by Conditions #46, #47, and #48.

e. written documentation of the quarterly calibrations of the monitoring devices required in Condition #50 and a report of corrective maintenance required as a result of the calibrations.

f. written documentation of monthly natural gas fuel consumption for the fiberizing/forming section and the oven/incineration section of the facility on a separate basis.

g. written documentation of the date and times when the firebox temperature in the thermal oxidizer required in Condition #47b is less than 1400°F.

h. written documentation of quantity of glass pulled to fiber on a daily basis and total for the month.

i. written documentation of corrective action taken to correct each event of malfunctioning operating or control equipment or any condition causing excessive emissions.

j. if no permit limitations were exceeded, the report must so state.

17. Periodic emission testing shall be required pursuant to District Rule 2:11.a.3.(f). Results of all emission testing shall be forwarded to the District for compliance verification. An emission testing protocol detailing

the methods of sampling and analysis shall be submitted to the District for approval 60 days prior to the initial testing and any subsequent test required under the above rule.

18. Newly graded areas where active construction ceases for more than ten (10) days shall be treated with a non-toxic dust suppressant compound and be left undisturbed.

19. References to rules, regulations, etc., within this permit shall be interpreted as referring to such rules and regulations in their present configuration and language as of the date of issuance of this permit.

20. The owner/operator shall provide all necessary emission offset requirements for ROG, NOx, and PM10 as specified by City of Shasta Lake Conditional Use Permit No. 96-07 prior to issuance of a District Permit to Operate for the facility. All emission offsets shall be approved by the District and be quantifiable, enforceable, and permanent. Any combination of the following shall be acceptable for use as emission offsets:

a. Best Available Mitigation Measures (BAMMs) as listed in the Air Quality Element of the City's General Plan,

b. Banked emission reduction credits as allowed by District Rule 2:2,

c. District-approved measures such as, but not limited to, paving roads within approximately 2 miles of the project site which are not associated with the project. If paving roads is selected for use as a measure for providing emission offsets, the following minimum analyses shall be accomplished on each candidate road segment to the satisfaction of the District prior to finalizing the specific roads to be paved:

1) Silt content of each road surface material
2) Traffic study to determine mean vehicle speed, trip lengths, number of trips, vehicle types, etc.
3) Precipitation data for calculating emissions shall be obtained from the Shasta Lake Fire Station

21. Fugitive and direct emissions, during facility operation including, but not limited to, any of the following, shall be controlled at all times the permitted emissions units are operating such that a public nuisance is not created beyond the plant property boundaries:

a. dust from paved or unpaved roads or any non-vegetation-covered area;

b. dust from materials-handling devices and/or storage areas;

c. accumulation of dust on outside surfaces including, but not limited to, the buildings, outdoor equipment, support pads, road areas. Surfaces shall be cleaned on a regular basis as needed to prevent buildup and/or fugitive dust;

d. dust from waste handling including waste from the water filtration system, wet electrostatic precipitator, dust collectors and waste containing unusable fiberglass. Waste shall be stored and transported in closed containers and handled at all times in a manner that prevents dust from becoming a public nuisance or a health hazard. It shall be the responsibility of the facility owner/operator to insure that any and all contract or company carriers adhere to this condition;

e. odorous chemical releases.

22. Agency Notifications: Correspondence shall be forwarded to each of the following agencies as required by the specific Authority to Construct conditions:

1. Air Pollution Control Officer
Shasta County Air Quality Management District
1855 Placer Street, Suite 101
Redding, CA 96001

2. Chief, Enforcement Office (Attn: Air-5)
U.S.Environmental Protection Agency Region 9
75 Hawthorne Street
San Francisco, CA 94105

3. Chief, Stationary Source Control Division
California Air Resources Board
P.O. Box 2815
Sacramento, CA 95814

23. The owner/operator shall finance the purchase and installation of two (2) EPA-approved PM10 monitors and two (2) Federal Reference Method (FRM) PM2.5 monitors, related supplies, and calibration equipment. The monitors will be used as special purpose ambient air monitors by the District for measuring PM10 and PM2.5 concentration levels at locations chosen by the District to provide necessary monitor security and representative sampling of ambient emission impacts from construction and operation of the proposed facility. In choosing the location of the monitors, the District will give special consideration to any sensitive receptors surrounding the proposed facility and locate at least one (1) collocated monitoring site at a school near to the facility. The monitors will sample on the same schedule and use the identical procedures as the other District-owned PM10 ambient monitors. In addition, the owner/operator shall finance the District operation and maintenance of the special purpose monitors for up to one (1) year prior to, and for a minimum period of two (2) years after, the commencement of operation of the facility by reimbursing the District for all staff time, materials, mileage, etc. associated with such activity in accordance with District Rule 2:11a.3.(e). The special purpose monitoring program shall be reconsidered upon annual permit renewal thereafter.

24. The owner/operator shall install and maintain an on-site meteorological station at the subject facility. The station shall include the capability to measure temperature and wind pattern data (direction and velocity) and record the results on continuous chart paper or retain the data on a data acquisition system.

25. The owner/operator shall finance an ambient monitoring program conducted by District staff for fugitive respirable fiberglass particle impact levels at specific receptor locations chosen by District staff within

proximity of the facility. At least one (1) monitoring site shall be chosen at a school near to the facility. The monitoring will be conducted using a medium volume ambient air sampler equivalent to Hi-Q Model MRV-0523c and NIOSH Method 7400 analysis in accordance with a monitoring plan submitted by the owner/operator and approved by the District. The plan will be submitted to the District no later than 60 days prior to startup. The monitoring program shall continue for a minimum period of one (1) year following startup of the facility and be reconsidered upon annual permit renewal thereafter. The results of this monitoring program must demonstrate that the fiber concentrations in the ambient air must be below a level of significant health impact as defined by the State Office of Environmental Health Hazard Assessment.

26. The owner/operator shall notify the District within four (4) hours of receiving any odor-related or fugitive emission-related complaint and shall provide the following information to the District:

    a. date and time of contact

    b. complainant's name, location, and description of complaint

    c. status of plant operations during time of complaint

    d. investigation results and any action taken to remedy problem

    A log of all complaints received will be maintained by the owner/operator for a minimum of five (5) years from date of entry and will be made available to the District upon request.

27. The owner/operator shall submit equipment drawings and design details of all baghouses, wet scrubbers, wet electrostatic precipitators, thermal oxidizers, settling chambers, dust collectors, and filtration modules to the District for approval prior to purchasing such equipment.

28. The owner/operator shall have an independent testing laboratory analyze particulate matter obtained from the emission tests required by Condition #55 for content of glass fiber in accordance with NIOSH Method 7400, and the results of the quantification shall be submitted as part of the emission test report.

29. All on-site roads and all off-site direct access roads to the facility shall be paved prior to commencing operational startup.

KNAUF FIBER GLASS
PSD AUTHORITY TO CONSTRUCT

RAW MATERIALS HANDLING AND MIXING (#97-PO-26)

OPERATING CONDITIONS

30. The 12,000 gallon phenolic resin tanks, the 15,000 gallon washwater liquid tanks, and the 15,000 gallon liquid urea tanks (all venting indoors) shall comply with all portions of the Federal New Source Performance Standards (40 CFR 60, Subpart Kb, Standards of Performance for Volatile Organic Liquid Storage Vessels). Notification with respect to commencement of construction (30 day notice), anticipated date of startup (30 day notice), actual date of startup (within 15 days), and modifications which could increase emission rates (60 days or as soon as practicable) shall be provided to the EPA Administrator noted in Condition #22 in accordance with 40 CFR 60.7.

31. All of the material handling vents and tank vents that discharge into the interior of the batch plant building shall be controlled by twelve (12) baghouse dust collectors that shall not allow any fugitive dust emissions from the building. The dust collectors shall be equipped with bag leak detectors which shall be calibrated on a regular basis to assure reliability. An audible alarm shall sound in the control room to indicate a torn or leaking bag. Spare bags shall be kept on site for immediate replacement of leaking or torn bags. Day Bin #1 and #2 dust collector emissions in the furnace building shall ultimately be discharged through the forming section exhausts and be controlled by the forming line scrubbers and wet electrostatic precipitator. Emissions from these dust collectors will, therefore, be measured as emissions from the forming line main stack #1.

32. The mineral oil tank shall store only distillates having a Reid vapor pressure less than four (4) pounds.

33. All railcar and bottom-dump hopper truck unloading of raw materials shall be done with a "dust boot" that seals the gap between the discharge of the hopper and the delivery system. The dust collectors on the material handling system shall be operational whenever materials are being delivered.

KNAUF FIBER GLASS
PSD AUTHORITY TO CONSTRUCT

GLASS MELTING (#97-PO-27)

OPERATING CONDITIONS

34. The glass melting furnace shall be heated only by electricity. No other auxiliary fuels may be used except during cold startup of the melting furnace or during prolonged electrical outages beyond the control of the facility when portable natural gas burners may be used to bring the temperature of the refractory and raw materials up to operating temperature. The APCO shall be advised of the intended use of the portable burners at least 24 hours prior to startup.

35. Molten glass production from the glass melting furnace shall be limited to a total of 195 tons in any 24 hour period. A permanent record of daily production shall be maintained and shall be available for inspection by the District, EPA, or CARB.

36. The method of control of suspended particulate matter from the glass melting furnace shall be the use of two baghouse dust collectors capable of meeting the emission standards specified in this permit. The dust collectors shall be equipped with bag leak detectors which shall be calibrated on a regular basis as recommended by the manufacturer to assure reliability. An audible alarm shall sound in the control room to indicate a torn or leaking bag. The owner/operator must initiate corrective action within 1 hour of an alarm from the bag leak detection system and complete corrective actions in a timely manner according to the procedures developed in accordance with the requirements of Condition #10 of this permit. Spare bags shall be kept on site for immediate replacement of leaking or torn bags.

37. Best available control technology (BACT) for this emissions unit shall be defined as the following emission control technologies capable of meeting the emission standards specified in Condition #41 of this permit:

    a. Use of two baghouse dust collectors for the control of particulate matter on the glass melting furnace.

    b. Use of an all electric glass melting furnace for the control of NOx, CO, SOx, and ROG.

38. The owner/operator shall record hours of operation of the glass melting furnace on a daily basis and shall install, calibrate, and maintain the following continuous monitors:

    a. Continuous glass pull rate monitor that records glass pull rate on an hourly basis

    b. Continuous dust collector bag leak detection system that records relative particulate matter emissions.

    The above records shall be maintained by the owner/operator for a minimum of five (5) years from date of entry and will be made available for District, EPA, or CARB inspection upon request.

39. The owner/operator shall maintain and operate a stack gas opacity monitor on the stack combining the baghouse discharge exhausts (#3a and #3b) from the glass melting furnace at a location approved by the District. The continuous opacity monitor shall meet all applicable design and quality assurance requirements specified in the Federal Register Parts 40 CFR 60.13 and 40 CFR 60, Specification 1 of Appendix B. The opacity monitor shall be installed and operational prior to conducting performance testing required in Condition #41 of this permit. A computer data acquisition system which has the capability of interpreting the sampling data, providing a graphical trend analysis, and producing a summary report of all three (3) minute averages of opacity readings shall also be provided. (40 CFR 60.13(h).)

40. The opacity from the above stack shall not exceed 5 percent opacity for a period greater than three (3) minutes in any one (1) hour period. An audible alarm shall sound in the control room to indicate an opacity exceeding the above opacity limit.

41. Within 60 days of startup of the facility, an emission test for particulate matter and gaseous fluoride and performance testing of the continuous opacity monitoring system (COMS) shall be conducted on the stack receiving the combined dust collector exhausts from the glass melting furnace. CARB Methods 1-5 including filter and impinger catch shall be used for particulate matter testing and EPA Method 13B shall be used for gaseous fluoride testing. Performance testing of the COMS shall be in accordance with 40 CFR 60.8 and 40 CFR 60.13. These tests shall be performed by an independent testing firm while operating at design capacity. The District shall be notified at least thirty (30) days in advance of such test to allow a District staff member to be present to verify compliance. In lieu of the above mentioned test methods, equivalent methods may be used if approved by the APCO. Results of all stack tests shall be forwarded to the District for compliance verification.

Total particulate matter emissions from the stack of the combined baghouse discharge exhausts (#3a and #3b) from the glass melting furnace shall not exceed any of the following emission limitations:

0.10 pounds per hour

0.44 tons per year

The sum total emissions of fluoride from the glass melting furnace baghouse exhausts (#3a and #3b) shall not exceed 15 lbs/day (.625 lbs/hr) per District Rule 2:1. Part 301.

42. Sampling ports shall be provided on the stack receiving the combined dust collector exhausts from the glass melting furnace. A sampling platform shall be installed by the owner/operator or safe access shall be provided during emission testing. The location of the sampling ports, platform, and/or arrangement for access must be approved by the District prior to installation of the stack.

KNAUF FIBER GLASS
PSD AUTHORITY TO CONSTRUCT

FIBERGLASS FORMING/CURING/COOLING LINES (#97-PO-28)

OPERATING CONDITIONS

43. The glass forming lines shall comply with all portions of the Federal New Source Performance Standards (40 CFR 60, Subpart PPP, Standards of Performance for Glass Fiber Manufacturing). Notification with respect to commencement of construction (30 day notice), anticipated date of startup (30 day notice), actual date of startup (within 15 days), and modifications which could increase emission rates (60 days or as soon as practicable) shall be provided to the EPA Administrator noted in Condition #22 in accordance with 40 CFR 60.7.

44. Natural gas shall constitute the only fuel allowed for use in the forming and curing sections.

45. Molten glass feed rate to the forming line shall be limited to a total of 195 tons in any 24 hour period. The owner/operator shall maintain a District-approved log indicating the throughput of molten glass material in tons/day. The log shall be available for inspection by either the District, EPA, or CARB.

46. The opacity of the main stack exhaust #1, excluding condensed water vapor, shall not exceed 20 percent for a period greater than three (3) minutes in any one (1) hour period. An audible alarm shall sound in the control room to indicate an opacity exceeding the above opacity limit.

47. Best available control technology (BACT) for the emission units under this permit shall be defined as the following emission control technologies capable of meeting the emission standards specified in Condition #52 of this permit, which shall be required to be operating whenever fiberglass is being produced:

    a. Forming Sections: Use of combustion controls which minimize peak flame temperatures in the fiber forming process for control of NOx, CO, and SOx. Use of Knauf process technology, six (6) venturi scrubbers on the bonded wool forming line and one (1) venturi scrubber on the unbonded wool forming line (each with a minimum of 10"wc pressure drop), followed by a wet electrostatic precipitator with continuous water spray wash system and four (4) electrical fields (minimum) for the control of particulate matter and reactive organic gases (ROG).

    b. Curing Section: Use of low NOx/CO burners burning natural gas for the control of NOx, CO, and SOx. Use of two thermal oxidizers operating in parallel with a minimum temperature of 1400°F and a residence time of at least 0.5 second for the control of ROG and particulate matter. (A lower minimum operating temperature, not less then 1200°F, may be used for the thermal oxidizers if, through emission testing, it is demonstrated to the satisfaction of the APCO that the lower temperature offers an equivalent emission control of ROG and particulate matter as provided by the 1400 F minimum temperature.)

    c. Cooling Section: Use of a water-washed settling chamber for the control of particulate matter and ROG with exhaust immediately combined with high-temperature exhaust of the thermal oxidizers.

48. The owner/operator shall continuously operate and maintain the venturi scrubbers for the removal of suspended particulate matter and for the pretreatment of the gas upstream of the wet electrostatic precipitator. The scrubbers shall maintain a minimum gas pressure drop of 10 inches water across the venturi throat and a minimum water flow to each scrubber of 200 gal./min. The pressure drop and water flow parameters shall be measured and recorded continuously. The solids in the scrubber water shall be removed to the extent necessary and fresh make-up water added as required in order for the wet electrostatic precipitator exhaust to meet the emission limits in Condition #52 at all times of operation.

49. The owner/operator shall continuously operate and maintain a wet electrostatic precipitator for the control of suspended particulate matter from the outlet of the forming zone venturi scrubbers. The wet electrostatic precipitator shall maintain a minimum water flow and a minimum total corona power as established during initial emission testing to determine compliance with 40 CFR 60, Subpart PPP.

50. The owner/operator shall install, calibrate, maintain, and operate monitoring devices that measure the following parameters at the frequency and accuracy as noted in Table 1:

Table 1

Parameters	Recording Frequency	Accuracy
Gas pressure drop across each scrubber (in.H_2O)	Continuous	±1" WC
Inlet water flow rate to each scrubber (GPM)	Continuous	±5% over range
Wet Electrostatic Precipitator inlet water flowrate (GPM)	Every 15 minutes	±5% over range
Wet Electrostatic Precipitator: Secondary current (Amps.) Secondary voltage (kV) Spark rate Corona power/T-R set per field Inlet temp. (^{o}F)	Every 15 minutes	±5% over range
Thermal Oxidizer: Exhaust temperature	Continuous	±5% over range

Settling Chamber water flow rate (gph)	Every 15 minutes	±5% over range

All monitoring devices required for the above parameters are to be recalibrated quarterly in accordance with procedures under Section 60.13(b) of 40 CFR 60.

51. The wet electrostatic precipitator inlet water total solids shall be determined daily using reference Method 209A, "Total Residue Dried at 103-105 °C," in *Standard Methods for the Examination of Water and Wastewater*, 15th Edition, 1980.

52. Total emissions from the main stack #1 shall not exceed the values shown in Table 2:

Table 2

EMISSION LIMITS:	POUNDS/HOUR (3 HR. AVG.)	LBS/TON OF GLASS PULLED (3 HR. AVG.)	TEST METHODS
PM10(as TSP)	28.4	3.50	EPA 5E
NOX(as NO_2)	5.66	.70	EPA 7E
CO	22.3	2.74	EPA 10
SO2	1.0	.12	EPA 6C
Non-Methane Hydrocarbon (as CH_4)	9.0	1.1	CARB 100 EPA 18
Ammonia	38.0	4.7	Bay Area AQMD ST-1B
Formaldehyde	2.0	.25	EPA 316
Phenol	6.0	.74	Bay Area AQMD ST-16
Gaseous Fluoride	.625	.077	EPA 13B

53. Four sampling ports must be provided on the main stack (located on the same horizontal plane, 90 degrees apart, and at least two [2] duct diameters downstream, and one-half [1/2] duct diameters upstream of any flow disturbance) and shall consist of 4-inch female NPT couplings welded to the stack. The couplings shall be supplied with 4-inch pipe plugs. A sampling platform shall be installed on the main stack. The location of the sampling ports and design of the platform must be approved by the District prior to installation.

54. Sampling ports must be provided on the inlet and outlet of the wet electrostatic precipitator, and on the outlets of the thermal oxidizers for the purpose of determining emission control efficiency. A sampling platform or other means of providing safe access to the sampling ports shall be installed. The location of the sampling ports and platforms must be approved by the District prior to installation.

55. Within 60 days of startup of the facility, performance testing of the continuous opacity monitoring system (COMS) and emission tests for the pollutants listed in Table 2, using the specified methods (or alternative testing methods approved by the APCO), shall be conducted by an independent testing firm at each of the following locations as indicated in Table 3 (see Condition #28 for additional testing requirements):

Table 3

EMISSIONS TESTS (X): / TEST LOCATION:	PM10 as TSP	NOX as NO_2	CO	SO2	NMHC as CH_4	NH_3	CH_2O	C_6H_6O	Fl_2
main stack #1	X	X	X	X	X	X	X	X	X
wet ESP exhaust	X	X	X		X				
wet ESP inlet	X				X				

NH_3 = Ammonia, CH_2O = Formaldehyde, C_6H_5OH = Phenol, Fl_2 = Gaseous Fluoride

Performance testing of the COMS shall be in accordance with 40 CFR 60.8 and 40 CFR 60.13.

These tests are for both compliance and control efficiency determinations and shall be performed while operating at design capacity producing the fiberglass product with the highest loss on ignition (LOI) expected to be produced. The District shall be notified at least thirty (30) days in advance of such test to allow a District staff member to be present for compliance verification. Results of all stack tests shall be forwarded to the District within 30 days of the test for compliance verification.

56. The owner/operator shall maintain and operate a stack gas opacity monitor at a location on the main stack (#1) approved by the District. The continuous opacity monitor shall meet all applicable design and quality assurance requirements specified in the Federal Register Parts 40 CFR 60.13 and 40 CFR 60, Specification 1 of Appendix B. A computer data acquisition system which has the capability of interpreting the sampling data, providing a graphical trend analysis, and producing a summary report of all three (3) minute averages of opacity readings shall also be provided. (40 CFR 60.13(h)).

57. Under no circumstances shall the owner/operator be allowed to operate the system with operational parameters beyond the limits specified in Conditions #45, #47, and # 48. The owner/operator shall take immediate action to bring the operational parameters to within the specified limits. Immediate action for the purpose of this condition shall be defined as within four (4) hours of the discovery of the exceedance.

KNAUF FIBER GLASS
PSD AUTHORITY TO CONSTRUCT

FIBERGLASS TRIMMING AND PACKAGING (#97-PO-29)

OPERATING CONDITIONS

58. The method of control of suspended particulate matter from the bonded wool forming line trimming and packaging areas, the Class A unbonded blowing wool processing area, and the Class B blowing wool processing area of the plant shall be the use of four (4) dust collector assemblies each followed by a high density filter module which shall exhaust inside the Scrap Building and have no outside vent. The performance of the above systems shall be capable of meeting the emission standards specified by California OSHA for air quality inside the Scrap Building. The dust collectors shall be equipped with leak detectors which shall be calibrated on a regular basis as recommended by the manufacturer to assure reliability. An audible alarm shall sound in the control room to indicate a leak in the dust collector. Spare cartridges and bags shall be kept on site for immediate replacement of leaking dust collector components. The filter modules shall be equipped with differential pressure measuring devices for daily monitoring and recording of the pressure drop across each filter bank.

59. The owner/operator shall monitor and have records available for inspection by the District, EPA, or CARB for the following parameters on a daily basis:

    a. Hours of operation

    b. Production rates

    c. Leaks from the dust collectors

    d. Pressure drop across the filter modules

    The above records shall be maintained by the owner/operator for a minimum of five (5) years from date of entry and will be made available to the above-mentioned agencies upon request.

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DISPERSION MODELING PROTOCOL FOR THE DETERMINATION OF AMBIENT AIR QUALITY IMPACTS FOR NOx

Prepared For

KNAUF FIBER GLASS GmbH
Shasta Lake, California

DRAFT

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Load Conditions

PSD guidelines require that air quality impacts be evaluated at minimum, intermediate, and maximum load conditions due to the variability of emission rates and stack exit conditions as a function of operating load. However, the Knauf facility can only operate at 100% load, so no part load modeling will be performed.

Meteorological Data

Meteorological data for the modeling will be based on five (5) years of hourly surface data from the Redding airport, covering the period 1987-1991. Concurrent upper air mixing height data was obtained from the nearest available source in Medford, Oregon. The data is pre-processed for input into the ISCST3 dispersion model. This period matches the years used in the original PSD application.

Terrain Data

The terrain surrounding the facility is considered complex, which is characterized by terrain features above the effective stack height of the forming stack. Since complex terrain modeling was required, digitized terrain in 30 meter increments out to 48 kilometers in each direction from the plant was obtained from the United States Geological Survey. The ISCST3 model will perform a linear interpolation using the nearest four (4) points in the terrain file.

Land Use Classification

Land use within 3 km of the proposed project site was evaluated in the original PSD application. The Auer classification procedure resulted in a rural determination since 70% of the area surrounding the facility was classified as rural. Therefore, rural dispersion coefficients will be used for future modeling.

Receptor Grid

In order to thoroughly evaluate the air quality impacts surrounding the plant site, a dense receptor grid using rectangular UTM coordinates will be used. The receptor grid will be:

- 100 meters out to 2600 meters
- 200 meters out to 5000 meters
- 500 meters out to 10000 meters
- 5000 meters out to 45000 meters

The grid will be adjusted, if necessary, so that the maximum impacts will be determined to the closest 100-meter rectangular coordinate. Figure 3 illustrates the proposed grid.

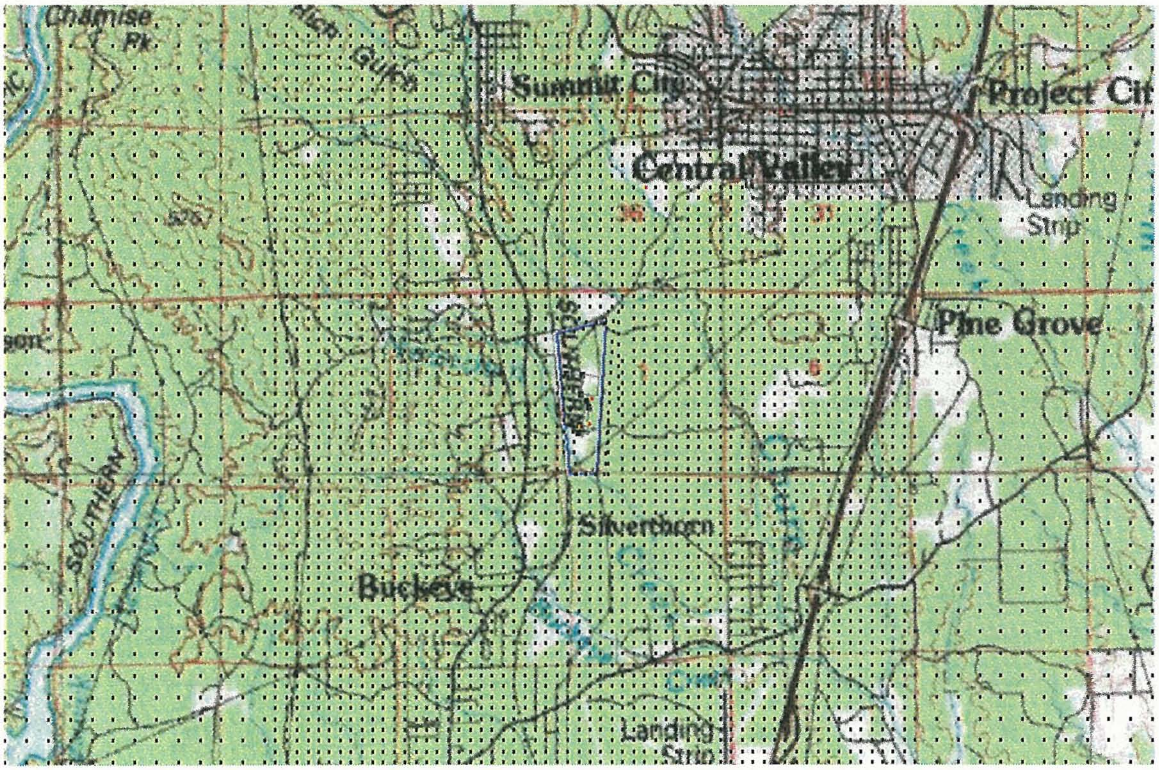

Figure 3. Sample Receptor Grid Near the Knauf Facility

Averaging Periods

The model will be set up to calculate the following concentrations:

NO_x Annual and 1-hour averages

Ambient Air Quality Monitoring Data

Existing ambient air quality data from Redding, California will be used for the background data. Data from the most recent three year period, 2000-2002, will be provided by Mr. Michael Kussow of the Shasta County Air Quality Management District.

Additional Impacts - Growth Analysis

A growth analysis has already been completed for the Knauf facility in Shasta and no further growth will be associated with the change in NOx emissions. Therefore, no new growth analysis will be completed.

Additional Impacts - Soils and Vegetation Impacts Analysis

The soils and vegetation impact due to air pollutant emissions will address potential for damage. The critical factors consist of, but are not limited to, the plant species, the ambient pollutant concentration, possibility of a reaction with other pollutants, the soil characteristics and moisture conditions, and the humidity of the atmosphere. This study will compare the increase NOx emissions impacts to EPA screening concentrations below which the soils and vegetation will not experience any adverse effects of air pollution (EPA, 1981, "A Screening procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals).

Additional Impacts – Visibility Impairment

The original PSD permit application included a Level II visibility impairment analysis for particulate emissions. No credit was taken for the fact that all PM-10 and NOx emissions were offset. Since actual PM-10 emissions are approximately 50% of the original study, no further visibility analysis should be required. The original study used a PM-10 emission rate of 43.6 lb/hr, and the PSD permit was issued at 28.4 lb/hr.

Ambient Air Quality Impact Results

To validate the air quality impact analysis, all modeling input and output files, plus meteorological data and terrain files, will be provided to the Region IX on CD-ROM. Modeling summaries will be included in an Appendix to the PSD permit application.

If you have any questions or comments regarding this protocol or require additional information, please contact the undersigned at 630-993-2127.

Respectfully submitted,

MOSTARDI-PLATT ASSOCIATES, INC.

Joseph J. Macak III
Principal Consultant

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DISPERSION MODELING
PROTOCOL FOR THE DETERMINATION
OF AMBIENT AIR QUALITY IMPACTS FOR NOx
Prepared For
KNAUF FIBER GLASS
Shasta Lake, California

DRAFT

MOSTARDI PLATT ENVIRONMENTAL PROJECT M030601
DATE SUBMITTED: MARCH 18, 2003

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DISPERSION MODELING PROTOCOL FOR THE DETERMINATION OF AMBIENT AIR QUALITY IMPACTS FOR NOx
Prepared For
KNAUF FIBER GLASS GmbH
Shasta Lake, California
March 18, 2003

INTRODUCTION

Knauf Fiber Glass GmbH (Knauf) operates a 195 ton per day fiberglass manufacturing facility in Shasta County, California. A site location map can be found in Figure 1. The plant site is a 92 acre parcel in Shasta Lake. The facility address is:

Knauf Fiber Glass
3100 District Drive
Shasta Lake, California 96019

Project Contact

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Manager, Environmental Health and Safety
Knauf Fiber Glass GmbH
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Consultant Contact

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Permit History

Knauf submitted an air quality permit application under the federal Prevention of Significant Deterioration (PSD) requirements on July 17, 1997. A PSD permit application was completed for PM-10 because there was potential for the particulate emission rates to exceed 100 tons per year and thus trigger PSD review for PM-10. Using the conservative estimates, PM-10 emissions would have been 191.8 tons/year (43.6 lb/hr), and the PSD threshold was 100 tons/year. All other air pollutant emissions were considered minor in comparison to the PSD threshold as shown in Table 1.

After an extensive period of appeals, the PSD permit was issued three years later on March 22, 2000 with a reduced PM-10 emission limit of 124.4 tons per year (28.4 lb/hr). Construction of the facility commenced immediately and the plant began operation on February 4, 2002. Air emissions testing was completed in April and December, 2002.

Based on oven and incinerator burner manufacturer's emission estimates, nitrogen oxides (NOx) emissions from the facility were expected to be minor due to the use of low NOx burners in the fiberglass curing oven. As a result, NOx was not formally evaluated under PSD in the original PSD permit application, but was evaluated in the CEQA EIR and the required California BACT analysis.

The results of the air emissions testing program demonstrated that the PM-10 emission rate was equivalent to a level below 100 tons per year (approximately 14 lb/hr without margin for uncertainty). NOx emissions test results demonstrated that the actual emissions resulted in a level that exceeded 40 tons per year, but were less than 100 tons per year.

This air quality modeling protocol has been prepared to present the methodology planned for an evaluation of the air quality impacts resulting from the NOx emissions increase from 24.8 tons per year to 74.5 tons per year.

Air Quality Standards

For areas that are in attainment with the NAAQS, maximum allowable increases or "increments" in ambient pollution concentrations have been established for PM_{10}, NO_x, and SO_2. These PSD increments are presented in Table 2, along with the California Air Resources Board Air Quality Standards (CARBAQS), Significant Impact Levels (for modeling purposes), and 8-hour Personal Exposure Limits (PEL). The PSD increments are an absolute ceiling, stated as the maximum allowable increases in concentration of the pollutant over a baseline concentration. In effect, the PSD increments, when added to baseline concentrations represent new ambient air quality levels for PSD areas.

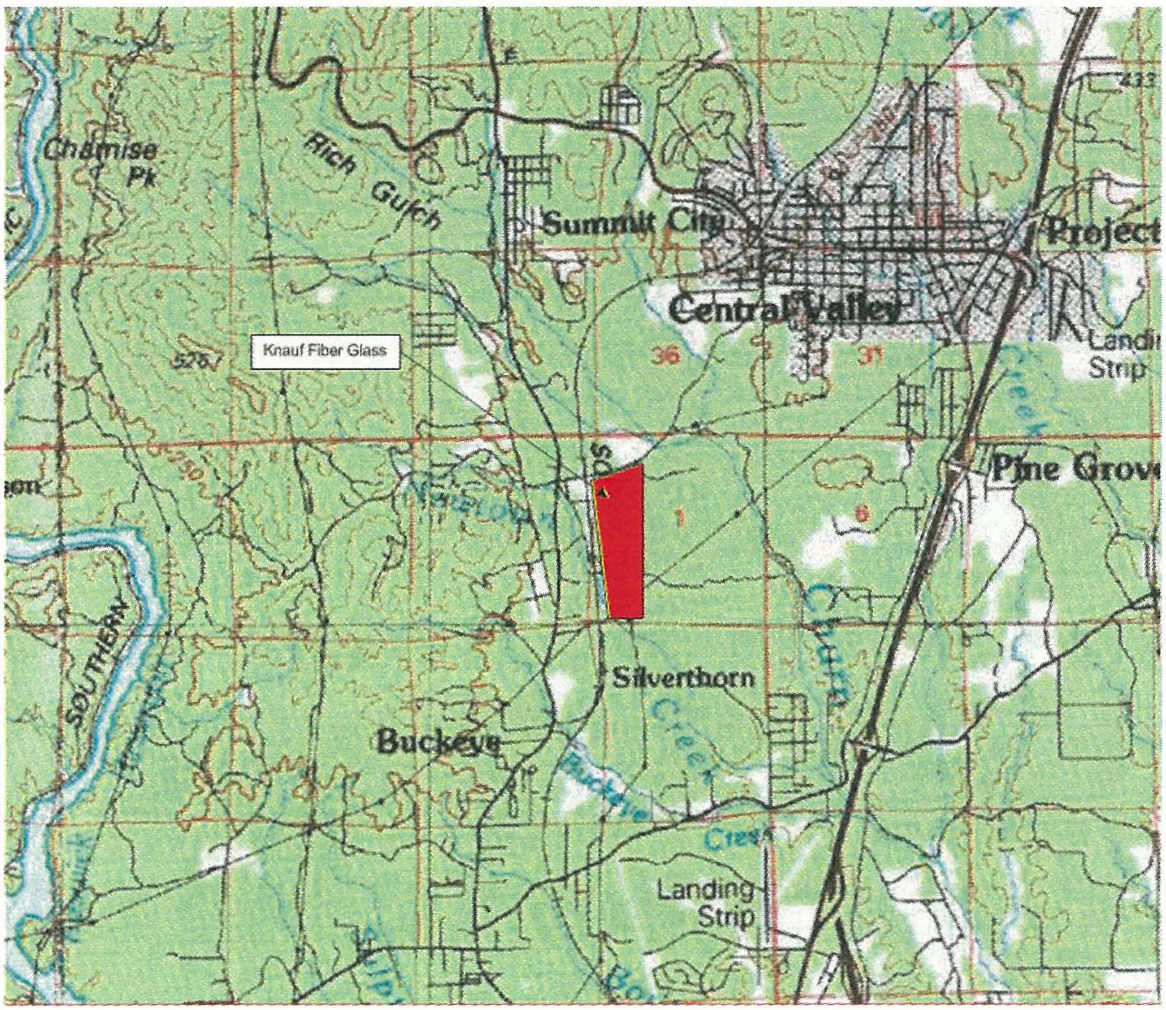

Figure 1. Site Location Map

Table 1. Knauf Shasta Facility Emissions from Original PSD Application.

Pollutant	Knauf Plant, TPY	PSD Review Required?
PM_{10}	191.8 (124.4)[a]	**Yes**
NOx	24.8	No
SO_2	4.4	No
CO	97.7	No
ROG (includes Formaldehyde and Phenol)	39.4	No
Formaldehyde	8.76	No
Phenol	26.28	No
Ammonia	166.4	No

Note: All PM is considered to be PM_{10}.
[a] PSD permit issued had a reduced PM-10 limit.

Emission Source

The NOx emissions are a result of combustion in the oven burners in the curing oven. After the fiberglass mat is formed, it continues on a conveyer to the curing oven. The purpose of the curing oven is to drive off the moisture remaining on the fibers and cure the binder. The oven has six zones. Each zone has its own low NO_x burner and blower to recirculate the hot air through the fiberglass mat. The oven temperature ranges from 450 °F to 550 °F. Hoods are at the entry and exit of the oven to capture the exhaust from the oven.

The regulated pollutants emitted from the curing oven are particulate matter and reactive organic gasses from heating the binder, and nitrogen oxides, sulfur oxides, and carbon monoxide from the natural gas combustion burners. These pollutants are sent to thermal oxidizers prior to entering the main stack.

NOx emissions from the oven burners are at, or below, the manufacturer's estimated levels; however, the unexpected increase in NOx above the permitted limit is primarily due to the conversion of ammonia (released from the binder during curing) to additional NOx when the flue gases pass through the thermal oxidizer.

Table 2. Air Quality Standards.

Pollutant	Averaging Period	NAAQS ($\mu g/m^3$)	CARBAQS ($\mu g/m^3$)	PSD Increment ($\mu g/m^3$)	Significant Impact Levels ($\mu g/m^3$)	PEL ($\mu g/m^3$)
Ozone	1-Hour	235	175	-	-	-
PM10	Annual	50	30	17	1	-
	24-Hour	150	50	30	5	-
NOx	**Annual**	**100**	**-**	**25**	**1**	**-**
	1-Hour	**-**	**500**	**-**	**-**	**-**
SO_2	Annual	80	-	20	1	-
	24-Hour	365	105	91	5	-
	3-Hour	1,300	-	512	25	-
	1-Hour	-	655	-	-	-
CO	8-Hour	10,000	10,000	-	500	-
	1-Hour	40,000	23,000	-	2000	-
Form-aldehyde	8-Hour	-	-	-	-	2,000
Phenol	8-Hour	-	-	-	-	19,000
Ammonia	8-Hour	-	-	-	-	18,000

AIR QUALITY IMPACT DISPERSION MODELING

Dispersion Model

Ambient air quality impacts for NOx from the Knauf facility will be assessed using the latest version of the Industrial Source Complex Short-Term (ISCST3) Prime dispersion model (with the Prime algorithm). The ISCST3 model was approved for use in the original PSD permit application and is proposed for the further evaluation of NOx emissions from the Knauf facility. The ISCST3 model is capable of assessing impacts from a variety of separate sources in regions of simple or complex terrain. If necessary, the ISCST3 model can evaluate impacts of multiple sources and sources over distances up to 31.25 miles (50 kilometers).

EPA regulatory default options (final plume rise, stack tip downwash, buoyancy-induced dispersion, default wind profile exponents, default temperature gradients, calms processing) will be used.

Facility structures (coordinates, height, ground elevation) will be programmed into the model as shown in the example in Figure 2. The model will perform direction-specific downwash evaluations if the stack heights are less than Good Engineering Practice (GEP).

The first phase of the modeling study will be a preliminary analysis to determine if there are any "significant" increases of ambient NOx concentrations from the facility. The preliminary analysis will determine if the project can forgo further air quality analysis for NOx, be exempted from the ambient air quality monitoring data requirements, and define the impact area within which a full impact analysis must be carried out.

A full impact analysis will be performed for NOx if the facility's estimated ambient pollutant concentrations exceed prescribed significant ambient impact levels. The full impact analysis, if necessary, will consider emissions from the proposed source, existing sources, and appropriate secondary emissions.

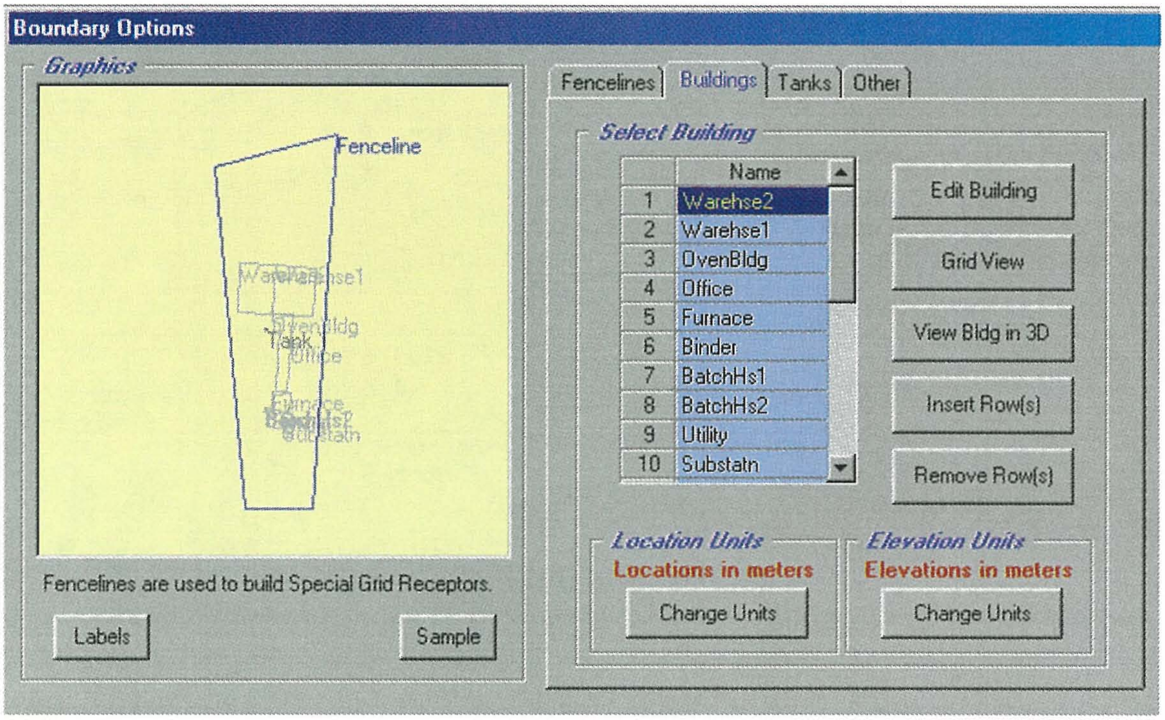

Figure 2. Sample Input Screen for Programming Facility Structures in ISCST3.

Emissions and Stack Parameters

The stack exit parameters and emission rate to be used in the modeling are presented in Table 3.

Table 3. Stack Exit Parameters and Emission Rates.

Parameter	Forming Stack
Stack Height, ft	199
Exit Temperature, deg F	190
Exit Diameter, ft	17
Flow Rate, ACFM	447,531
Exit Velocity, ft/s	32.9
NOx Emissions, lb/hr	20.5